

Vista Nuclear Solutions

Dennis Kelley
(317)823-1745
DBK222@Aol.com

VISTA NUCLEAR SOLUTIONS: INTRODUCTION, TECHNICAL PAPERS AND TECHNICAL INFORMATION

** If you would like a copy of a document, No. 4-26, please identify the number on your "Contact Us" form

1. Vista Nuclear Solutions / Nochar Introduction to N Series Technology	2023
2. Vista Nuclear Solutions PPT Introduction	2023
3. N910 Material Safety Data Sheet	2022
N935 Material Safety Data Sheet	2022
N960 Material Safety Data Sheet	2022
4. Italy, SOGIN: Predis Webinar: Sludge Oil Solidification / Cementation	2021
5. France, CEA / ONET Technologies: DEM Conference: PPT Solidification	2021
6. Slovakia, VUJE: WM Conference: ILW Oil at Mochovce NPP / Cementation	2020
7. Vista Global Case Studies, WM Conference: Applications and Disposal Options	2020
8. Belgium, Belgoprocess, WM Conference: LRW Solidification and Incineration	2019
9. Kazakhstan, WM Conference: LRW Solidification and Sulfur Composite Matrix	2018
10. Romania, WM Conference: Solidification of H-3 Liquids and Solid Materials	2016
11. IAEA, LRW Global Case Studies	2016
12. U.K Harwell: PPT, Decommissioning of Tube Stores / Cementation	2015
Harwell: Water Recovery Project	2015
13. Kazakhstan, WM Conference: Solidification and Encapsulation of LRW	2015
14. Slovenia, ARAO: NENE Conference: LRW Medical Waste Solidification	2014
15. Russia, WM Conference: Radiation and Thermal Stability of Polymers	2013
Russia, WM Conference: PPT, Summary of Radiation and Thermal Stability	2013
16. Kazakhstan, WM Conference: BN-350 LRW Solidification	2014
17. France, AREVA, WM Conference: Organic/Aqueous Solidification at Cadarache	2013
18. Russia, CNS Conference: Liquid Solidification Experiments at ROSATOM Sites	2011
19. Romania, ICEM Conference: PPT, Organic Liquid Solidification at Cernavoda NPP	2011
20. U.S. DOE / Russia, WM Conference: Proliferation Prevention in Russia, No. 2	2010
21. U.S. DOE / Russia, WM Conference: Solidification Technologies, No. 1	2008
22. U.K., Sellafield, ICEM Conference: Oil Immobilization Program, Update	2007
23. U.K., Sellafield, WM Conference: Oil Immobilization Test Program	2007
24. China, China Atomic Energy, WM Conference: Scientific Investigation Results	2006
25. U.S. DOE, GLOBAL Japan Conference: U.S. & International Case Studies	2005
26. Russia, ICEM Scotland Conference: Innovative Application for LRW	2005

VISTA - NOCHAR SUMMARY: RADIOACTIVE LIQUID SOLIDIFICATION TECHNOLOGY

Description of Nochar “N” Series Technology

- Engineered polymers permanently immobilize and solidify most radioactive liquids
 - Polymer technology has been applied at global nuclear sites since Year 2001
- Process is **Absorption**, not **Adsorption**: competitive sorbents are Adsorbents – surface collectors
- Nochar is not an encapsulation technology – liquid becomes a solid form over time
- Minimal volumetric increase in the solidification process: less than 10% for organic / less than 5% for aqueous
- No liquid release under standard compression tests; process is permanent / some evaporation
- Solidification time: 12 – 48 hours for organic liquids depending upon the bonding ratios and liquid composition; 4-6 hours for most aqueous liquids
- Chemical / mechanical reaction for N910 polymer (for hydrocarbon waste). Mechanical reaction for N960 and N935 polymer (for aqueous and light alcohol waste)
- Polymers suppress hydrocarbon vapors, reduces the risk of fire, raises flashpoint to ---
- No degradation of polymer or waste form from radiation; polymers have high thermal stability
- Polymer is not a gas generator
- Helps to immobilize heavy metals
- Immobilizes H-3 contaminated organic and aqueous waste forms
- Reduces H-3 air release in the solidified form
- Radiation and thermal stability: extensive testing conducted in Russia, China and United States
 - 270,000 gray on organic / nitric acid waste
 - 9,000 gray on TBP simulant
 - 7,500 gray on 14.2 pH, sodium hydroxide
 - Tests in 3 countries have same results: no degradation, no breakdown, no liquid release
- Mixing may be required; slow speed mixing; safe and simple process
 - Polymers are non-toxic, non-hazardous
- Final disposal options for interim or final storage
 - Direct disposal into stainless or carbon steel drums
 - Direct disposal in highly integrated containers (HIC) liners then placed in steel drums
 - Encapsulation in cement for homogeneous or non-homogeneous encapsulation
 - Encapsulation in molecular sulfur and inorganic material matrix (under USA patent)
 - Incineration; polymers generate 0.02% ash / total ash content at less than 5%

Description of Nochar “N” Series Technology (cont.)

Applications

- Mixed sludge types; oil, oil-water with other solid contaminants such as salt, sand, dirt
- Pump and machine oil, various types of synthetic and standard oil
- All organic liquids including scintillation cocktails, tri-butyl phosphate (TBP)
- Aqueous liquids; water, low pH acid, high pH alkaline solutions
- Spent light alcohols; glycol, methanol, ethanol
- Radiological contaminants including heavy metals, isotopes, H-3
- Low level (LLW) and intermediate level waste (ILW)

Process

- We strongly recommend that each waste stream undergo a bench test, in order to verify the composition of the solution, to determine the best polymer formula for solidification and to determine appropriate and safe solidification ratios, based on liquid : polymer by weight
- Mixing may be required, especially if aqueous liquids are present
- Polymers may be blended into the formula, to capture mixed organic and aqueous liquids
- Solidification ratios will vary, depending upon the chemical composition of the waste
 - Oil, generally 1:1 – 3:1 (liquid : polymer)
 - Mixed sludge types, generally 2:1 – 4:1
 - Aqueous solutions, generally 2:1 – 5:1
 - Ratios will determine the amount / cost of polymer to be used for treating a specific volume of waste

Vista Nuclear Solutions

Representative Projects since Year 2001

- U.S. Department of Energy, Mound, Ohio
 - Pump oil with tritium; 50,000 curies over a 3-year period. Disposal at Nevada NS Site
- U.S. Department of Energy, Rocky Flats, Colorado
 - One of the first nuclear weapons complex to undergo full decommissioning
 - All liquid waste contained plutonium
 - Methanol solution with organic contaminants
 - Mixed organic waste with carbon tetrachloride and trichloroethylene
 - Spent pump oil
 - Disposal at Waste Isolation Pilot Plant (WIPP) for Transuranic waste forms



Rocky Flats Facility



Oil + Pu Solidification



Packaging for Final Disposal

- U.S. Department of Energy, ongoing projects at Argonne National Lab, Los Alamos National Lab, Oak Ridge, Savannah River and other DOE sites
- Canada
 - Ontario Power Generation, Pickering and Darlington NPP's
 - Over 25 different waste streams
 - Sludge types
 - Organic and aqueous solutions
 - Various acids
 - Disposal at Western Waste Management Facility
 - Canadian Nuclear Labs, Chalk River & Whiteshell
 - ILW acids in hot cell application

Representative Projects since Year 2001 (cont.)

- U.K.
 - Harwell Storage Tube project, remote handled ILW water contamination
 - National Award given by the U.K. Nuclear Decommissioning Authority in 2015 for Best Innovative Technology for SME
 - Encapsulated in cement; packaged in 500 liter drums
 - Sellafield, over 90 sludge types solidified



Harwell Storage Tubes



Perforated Bags-Cement



Sellafield Oil Sludge Solidification

- France
 - Cadarache LOR, organic solutions containing TBP conducted by STMI-AREVA
 - Complex liquid waste streams, treated by AREVA / ORANO and ONET Technologies



TBP Solution Solidified with N910



TBP-Organic + Aqueous Solution

Representative Projects since Year 2001 (cont.)

- Romania
 - Cernavoda NPP; machine oil with tritium, large scale production (more than 40MT)
 - Transported to Cyclife, Sweden and Belgoprocess, Belgium for incineration
 - FCN Pitesti, fuel fabrication site: Tri-butyl phosphate (TBP)



Polymer Mixing Process



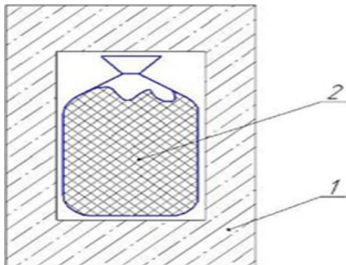
Final Solidification

2.5 : 1 Ratio



Solids Contaminated
with Oil +Tritium

- Russia
 - Projects at Khlopin Radium Institute, St. Petersburg, Siberian Chemical Combine, Tomsk, and Mining Chemical Combine, Krasnoyarsk
 - Over 250 complex radioactive waste streams solidified
 - Extensive test work conducted on radiation and thermal stability
 - Final disposal of Khlopin waste streams at RADON Sosnovy Bor; cementation
 - Nochar is the only foreign absorbent technology to be certified by ROSATOM



Design for Encapsulation



Final Disposal – Sosnovy Bor



Irradiation at 2.7 Million Gray

Representative Projects since Year 2001 (cont.)

- Slovenia
 - ARAO, regulator and waste treatment facility; solidification of medical waste composed of toluene with high concentration of methanol and ethanol
 - Krsko NPP, oil and solvents containing tritium solidified, shipped to Cyclife, Sweden for incineration
- Italy
 - SOGIN, decommissioning project at Bosco Marengo; 1.5 cu. meter of oil sludge solidified and encapsulated in cement
 - Mixing device used to create a homogeneous matrix, then cementation
 - Aqueous content with resin beads, solidified for incineration at JAVYS, Slovakia
 - Project successfully completed in December, 2021
 - Pictures of cementation results shown on next page



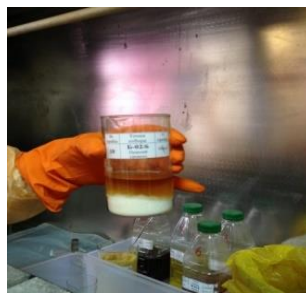
- Slovakia
 - ILW oil solidified at Mochovce NPP by VUJE
 - Encapsulation in cement for final disposal
- China
 - China Institute of Atomic Energy, Beijing, extensive irradiation and stability test program
 - Successful completion of two mixed waste projects
 - Comprehensive test programs underway for regulatory approval for final disposal

Representative Projects since Year 2001 (cont.)

- Kazakhstan
 - Two-year project sponsored by the U.S. Department of Energy at MAEC, Aktau (2015)
 - Active saline solutions with high salt content, oil and sodium hydroxide solidified from BN-350 Fast Breeder Reactor
 - New encapsulation technology developed using sulfur and inorganic filler material matrix



Oil Solidified with N910+ Encapsulated by Sulfur materials



Sodium Hydroxide + N960



Solidified Sodium Hydroxide

Technical Information Available upon Request

Material Safety Data Sheets, available on the Vista website

Technical Papers: Research and Project Studies, available on Vista website

- Belgium
- Italy
- France
- Kazakhstan
- Romania
- Russia
- Slovakia
- United Kingdom
- China
- Global Case Studies

Technical assistance available upon request

Nochar Solidification Technologies 2000-2023

- Introduction to Vista Nuclear Solutions, Nochar
- Description of products
- Procedures and processes
- Product development in DOE complex
- Global case studies - applications
- Scientific research to validate technologies
- Disposal options

Introduction to Vista & Nochar

- Nochar headquarters and factory in Indiana, USA
 - 1986 fire retardants, 1990 high tech polymers
 - No international production locations
- Vista Nuclear Solutions, Indiana
 - Manages all international activities
 - R&D, technical assistance & training, commercial
- Proprietary technology – classified “trade secret”
 - No patents
- Products for nuclear markets
 - Polymers for liquid solidification
 - Drum pad for compaction waste

Vista Nuclear Solutions



Description of Nochar Technologies

- Engineered polymers that permanently immobilize most radioactive liquids; organic, aqueous, light alcohols
- Process is Absorption, not Adsorption; competitive sorbents are surface collectors, which causes leaching
- Nochar is not an encapsulation technology; liquid enters polymer pores, matrix formed; dries, immobilization
- Polymer is activated by hydrocarbons in organic liquid
- No liquid release; process is permanent, some evaporation; no heat build up and no heat release
- Minimal volumetric increase; depends on the waste stream; 5-10% for organic, 0-3% for aqueous
- Non-hazardous, non-toxic, worker-friendly product

Description of Polymers

- N910 polymer, applied to all organic liquids
 - Thermoplastic elastomer: styrene block co-polymer
 - Mechanical and chemical process
- N960 polymer, applied to all aqueous liquids
 - 100% cross linked, co-polymer of acrylamide
 - Mechanical process
- N935 polymer, applied to spent light alcohols
- Three polymers apply to 98% of liquids found in the nuclear sector
- N990 special polymer for aged oil
- No unreacted , free monomers in polymers
- No single monomer release
- Polymers suppress hydrocarbon vapors, reduce risk of fire; raise flashpoint

Polymer Capabilities

- Solidify complex liquid waste streams
 - Tributylphosphate - TBP (kerosene and n-paraffin)
 - Scintillation fluids
 - Mixed sludge types
 - Ethanol / methanol / glycol (spent)
 - Acid – alkaline solutions
 - High salt content / other solids
- Immobilizes H -3 and heavy metals
- Solidifies PCB contamination
- Radiation and thermal stability
 - LLW, ILW and HLW contamination
 - Gamma, alpha and beta
- Polymers are not gas generators (tests in Russia & Italy)
- Problematic liquids for solidification: acetone, 100% synthetic oil

Markets – End Users

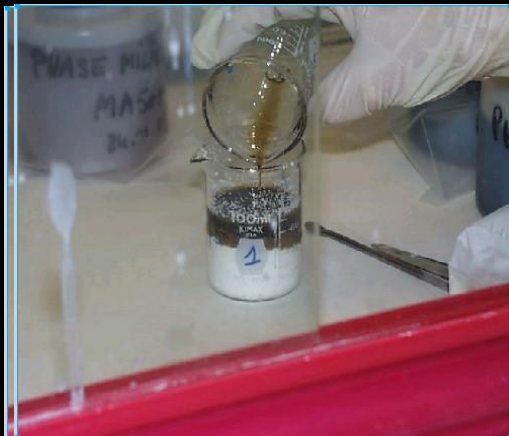
- Nuclear power plants
- Research laboratories and institutes
- Weapons facilities
- Fuel fabrication facilities
- Reprocessing facilities
- Medical isotope facilities / medical waste
- Naval ships
- Industrial / mining

- Decommissioning
- Legacy drums with liquids at bottom
- On site for emergency spills- accidents

Procedures and Processes

- Solidification times differ, according to waste composition
- Polymers combined, solidify mixed waste, sludge types
- Solidification time for organic liquids: 24-48 hours
- Solidification time for aqueous liquids: 2-12 hours
- Bonding ratios
 - For organic streams, 1:1 – 3:1 (liquid : polymer by weight)
 - For aqueous streams, 1:1-5:1
 - Safety and security is primary objective
- Mixing
 - Slow speed, short term (liquid and polymer to connect)
 - High speed mixing can damage polymers
- Importance of bench testing each waste stream

Vista Nuclear Solutions



Bench Test Protocols

- Each drum or container may have different streams
- Polymers are not a “catch all” for unknown streams
- Full characterization of waste stream is not mandatory
 - Critical components: % organic, % aqueous, type of contamination (H-3, etc)
 - Age of waste stream
 - Is the stream in phases?
- Establish best polymer formula, per waste stream
 - Solidification ratios
 - Mixing requirements
 - Safety, security
 - Requirements for final disposal / packaging
 - Economic factors

Product Development in U.S. DOE

- 1997-1999, test program at DOE Savannah River
- Nochar selected as best absorbent technology for organic liquid solidification
- Mound site (Ohio), 2001, first project – pump oil with tritium; final storage at Nevada National Security Site - NNSS
 - 50,000 curies of waste solidified over 3- year period
- Rocky Flats, Colorado, 2003, first nuclear weapons complex to undergo full decommissioning; all transuranic - TRU waste
 - All liquid contained plutonium; spent pump oil; 1- 3.8L bottles
 - Methanol solution with organic contaminants
 - Mixed organic waste with carbon tetrachloride and trichloroethylene
 - \$ 10 million cost savings to DOE
 - Final storage at Waste Isolation Pilot Plant- WIPP, New Mexico

Vista Nuclear Solutions



Nuclear Power Plant Applications

- Standard Operations
 - Similar types of waste streams: machine and pump oil, various sludge types (water, solids and oil), scint fluids, solvents
- Romania – Cernavoda NPP
 - Large scale production, more than 40 MT of oil with tritium
 - Solidification ratio: 3 : 1, packaged in poly bags
 - Interim storage on site in 220 liter drums
 - Transported to Cyclife (Sweden) and Belgoprocess (Belgium) for incineration
 - Solids (plastic, gloves) contaminated with oil + tritium
- Slovakia – Mochovce NPP
- Canada - Ontario Power Generation – Pickering & Darlington NPPs
 - Sludge types, organic, acidic and other aqueous solutions
 - 25+ different waste streams
 - Disposal at Western Waste Management Facility, Ontario

Vista Nuclear Solutions



Vista Nuclear Solutions



Vista Nuclear Solutions



Slovakia, Mochovce NPP- VUJE

- ILW oil sludge (Dowtherm)
- Cs-137, Am-241, Pu-238, 239, 240
- N910 polymer solidified oil
- Cementation, homogeneous matrix
 - 35% Dowtherm / N910, loading factor
 - 10% dry sludge
 - 55% cement
- 2-year leach test, compressive strength tests
 - Leachability of alpha radionuclides, lower than 0.1%
- Project completed in 2022



Fig. 3: Product of solidified sludge with 35% of DW in cement matrix with Nochar N910 after compressive strength test. – homogeneity

Fig. 2: Product of solidified sludge with 35% of DW in cement matrix with Nochar N910 after 2 year leaching period



Research Labs and Institutes

- United Kingdom
 - Sellafield Sites
 - Over 90 oil sludge waste streams solidified in test program
 - Encapsulation in cement
 - Harwell Storage Tube Project
 - Remote handled ILW water contamination
 - Encapsulation in cement
 - Packaged in 500L drums
 - 2015 award by U.K. Nuclear Decommissioning Authority (NDA) for Best Innovative Technology for SME (NSG, Rutpen)
 - Dounreay HLW oil
 - LLWR (Drigg) evaluation test program completed; cementation, will review acceptance on a case-by-case basis

Vista Nuclear Solutions



Vista Nuclear Solutions



Research Labs and Institutes

- France
 - Cadarache
 - Multiple projects with AREVASTMI
 - Complex TBP solutions
 - Marcoule
 - Complex aqueous stream with low pH
 - CEA Fontenay aux Roses (Paris)
 - 60 containers / 800L of unknown waste streams
 - Creative methodology for solidification of all waste streams
 - Disposal routes – incineration
- Canada
 - Whiteshell, Canadian Nuclear Labs; mixed sludge, on-site disposal in B-25 stainless boxes; future disposal at Chalk River Labs
 - Chalk River, CNL; ILW acidic waste streams
- Russia
 - Khlopin Radium Institute, Gatchyna
 - ILW organic waste streams; remote handled
 - Encapsulation in cement, final storage at RADON

France:CEA Fontenay aux Roses Paris

- CEA, ONET Technologies, Tech y Tech collaboration
- 60 drums / bottles / cans of unknown liquid waste
- Total waste: 800L
 - 400L of unknown waste
 - 150L of dodecane, TBP, ethanol, demineralized water
 - 250L mixed waste
- Ng10 (organic), Ng35 (light alcohols), Ng60 (aqueous)
 - Ratios: 1 : 1 for 90% of waste; 2 : 1 for 10% of waste
- Innovative process, mixing required
- Solidification placed in plastic bags
- Placed in plastic drums with wood pellets
- Suitable for incineration at CENTRACO, Cyclife

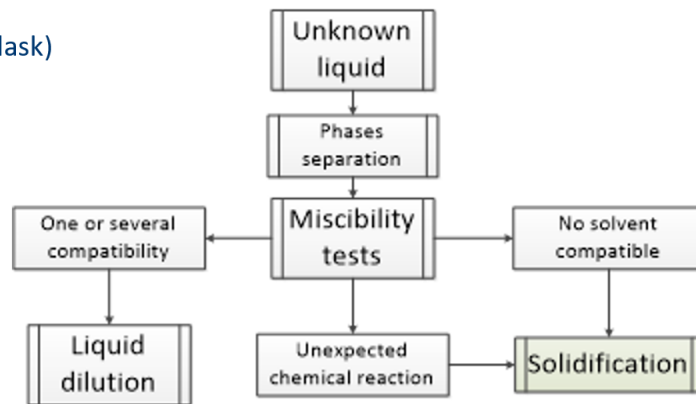
Initial DATA

60 containers (drums / bottles / cans / others)

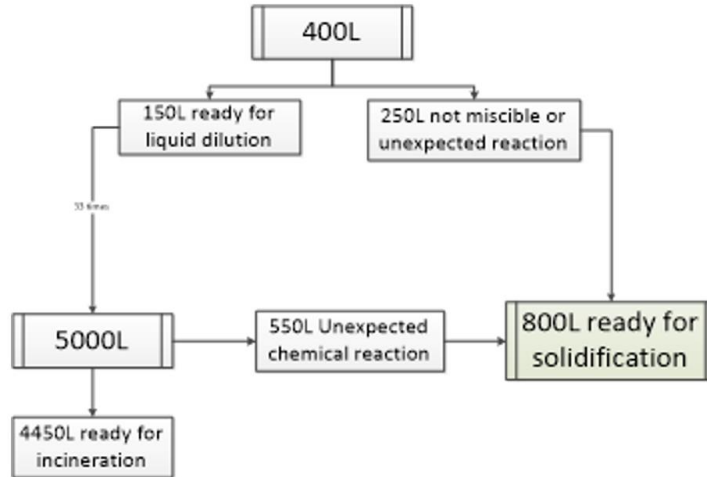
91 phases

60 flasks (200mL / flask)

Total 400L



Initial DATA



Solidification technology

NOCHAR® N910

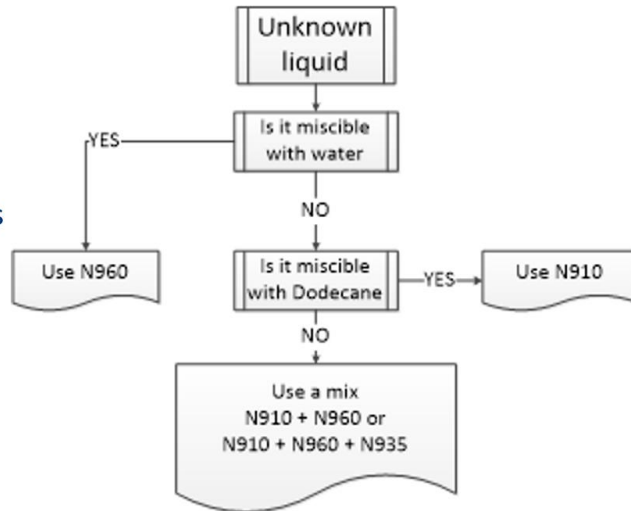
applied to all organic liquids

NOCHAR® N960

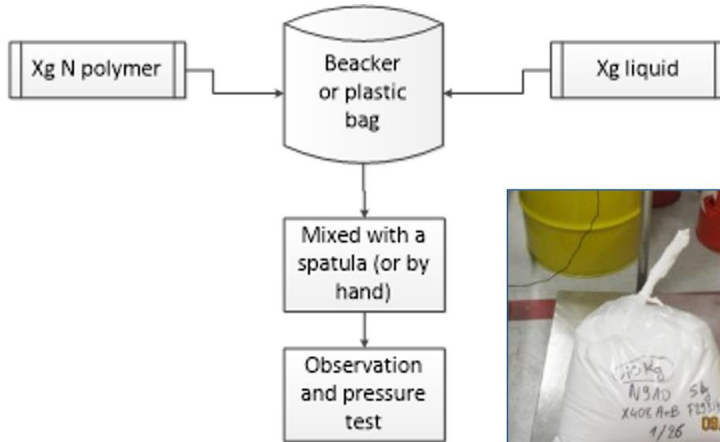
applied to all aqueous liquids

NOCHAR® N935

applied to light alcohols



Solidification methods



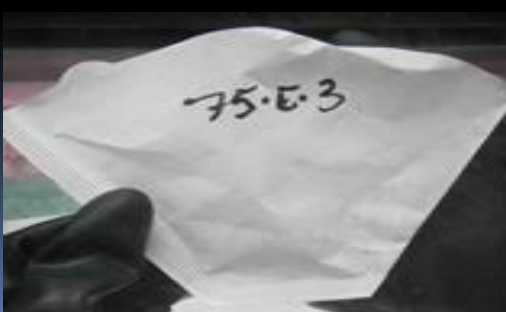
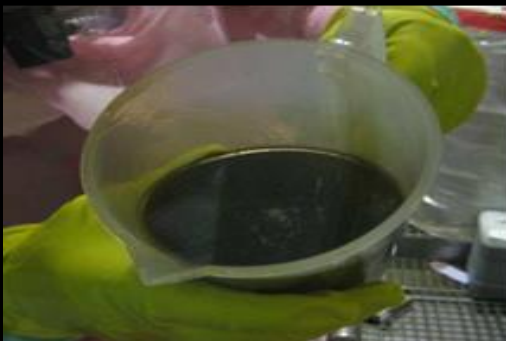
Waste Streams at Cadarache

20 year old legacy streams, no pathway for disposal





Volume (L)		LOR 20 208	LOR 75 137
Mass (kg)		206	137
Composition		11% Xylene (C ₈ H ₁₀) 1.6% Mesitylene (C ₆ H ₃) 0.4% Diphenylacazole (C ₁₂ H ₁₁ NO) 0.1% TBP (PO(OC ₂ H ₅) ₂) 91.4% Water	8.6% TBP (PO(OC ₂ H ₅) ₂) 91.4% Water
Physical chemistry characteristics		1.7 mg g ⁻¹ Chloride 0.61 mg g ⁻¹ Fluoride 0.9 mg g ⁻¹ Sulfate	1.3 mg g ⁻¹ Chloride 0.23 mg g ⁻¹ Fluoride 2.1 mg g ⁻¹ Sulfate
Radiological characteristics	Spectra	Am-241 Co-60 Cs-137 H-3	Am-241 Pb-241 Cs-137
	Mass activity	A _{Alpha} = 3.78x10 ⁸ Bq.g ⁻¹ A _{Beta/Gamma} = 5.55x10 ⁷ Bq.g ⁻¹ A _{Tritium} = 3.47x10 ⁶ Bq.g ⁻¹	A _{Alpha} = 8.67x10 ⁸ Bq.g ⁻¹ A _{Beta/Gamma} = 8.62x10 ⁷ Bq.g ⁻¹

Vista Nuclear Solutions

France – Cadarache Complex TBP Solutions



Vista Nuclear Solutions

Sample	Colour	Physical appearance	Picture
75-E-1	Beige	Sticky, doughy and very glistening. Presence of residual moisture with an important quantity of waste which has not reacted.	
75-E-2	Light beige	Sticky, doughy and lightly glistening	
75-E-3	Very light beige	Dry : all waste has reacted with a presence of a polymer excess which seems to be the N910	
75-E-4	Very light beige	Dry : all waste has reacted	

Russia: Research & Development U.S. DOE Project at Three Weapons Sites

- Active in Russia since 2002
- Partner: VG Khlopin Radium Institute, St. Petersburg (1st on site at Chernobyl)
- Over 300 waste streams on highly complex streams: LLW, ILW and HLW
- Only foreign solidification technology to be approved / certified by Roshtenadzor–ROSATOM
- DOE sponsored “proliferation prevention” 3 year project involving 50 weapons scientists
- Argonne National Lab, Chicago, my partner

Russian Sites- ROSATOM

- Khlopin Radium Institute, Gatchyna
- RADON, Sosnovy Bor NPP (repository)
- RADON, Moscow (repository)
- Siberian Chemical Combine (SCC), Seversk (Tomsk)
- Mining Chemical Combine (MCC), Zheleznogorsk (Krasnoyarsk)

Vista Nuclear Solutions



Vista Nuclear Solutions

Russia: Organic Sludge with Heavy Metals
Nitric Acid with Pu
At KRI Gatchyna Facility

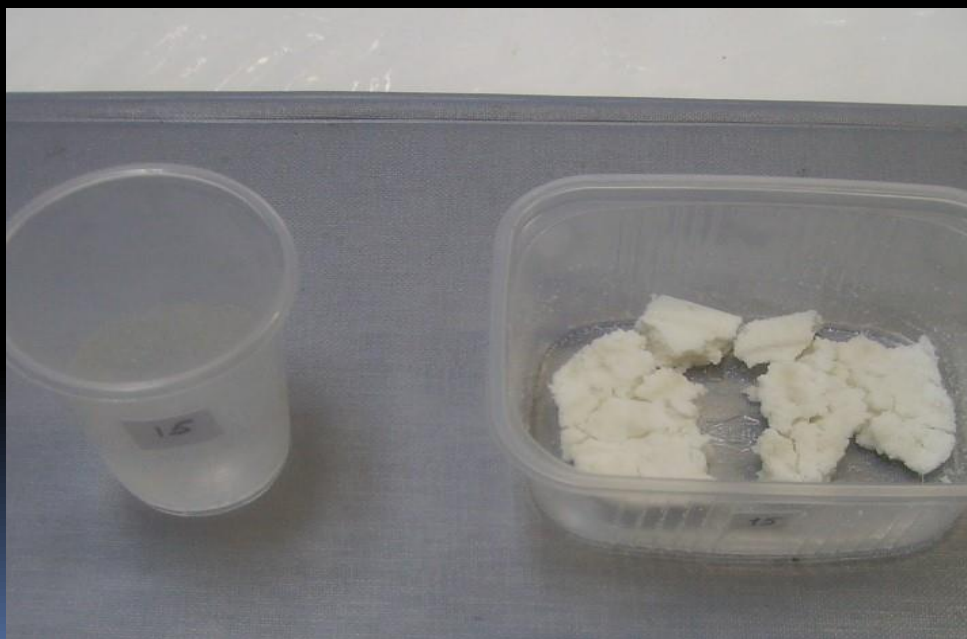


Vista Nuclear Solutions

	Characteristic (composition) of wastes	Conditions of solidification			Results
		Volume of waste used, ml	Amount of # 960 used, g	Amount of # 910 used, g	
4232	Sludge residue from the bottom of the apparatus (aqueous phase). U-80g, NaNO ₃ ~200g, HNO ₃ -0,8 M/l	6	8	0,5	Successfully solidified
4231	Sludge residue from the top of the apparatus (occurrence of organic phase is probable). U-80g, NaNO ₃ ~200g, HNO ₃ -0,8 M/l. Very thick black liquid.	6	8	0,5	Successfully solidified
4237	LL decontaminating solution with low amounts of organic substances. U -153 g/l, NaNO ₃ ~100-150g, HNO ₃ 2,5 M/l	12	8	0,5	Successfully solidified
4238	LL decontaminating solution with low amounts of organic substances. U -153 g/l, NaNO ₃ ~100-150g, HNO ₃ 2,5 M/l	20	4	2	Successfully solidified
4125	U-20 g, NaNO ₃ 40g, HNO ₃ 1,2 M/l. There was a precipitate in the solution.	15	16	0,5	Successfully solidified
4283	Uranium re-extracts. U -70g, HNO ₃ 0,07 M/l.	20	4	1	Successfully solidified

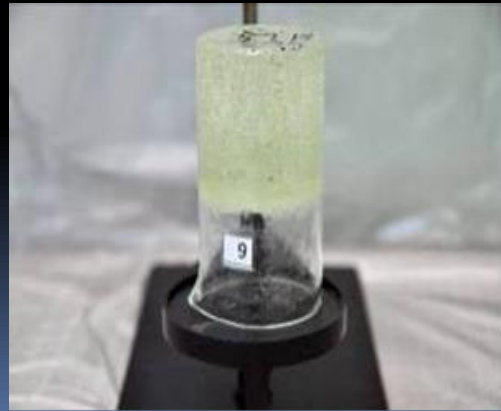
Vista Nuclear Solutions

Solidified sample after adding water
Solution: HNO_3 1,0M
No volumetric increase

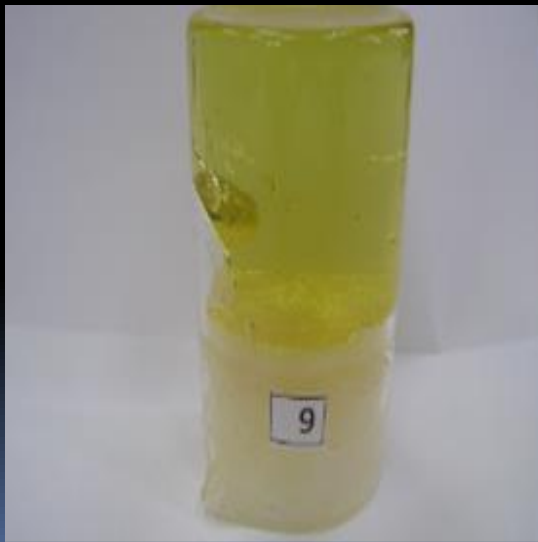


Vista Nuclear Solutions

Zheleznogorsk: TBP- Hexachlorobutadiene
Spent solution, highly toxic, corrosive
5:1 ratio with N910
Glass-like, transparent, elastic solid
Mixing eliminated air bubbles
Best outcome for this waste stream



Zheleznogorsk TBP + HCBD Solidified
Paraffin Wax Encapsulation
Contained toxic gas emission
Approved for final disposal

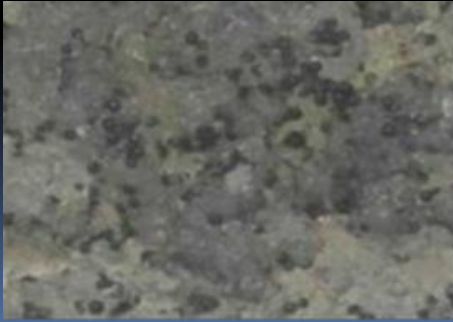


Vista Nuclear Solutions

Seversk Siberian Chemical Combine (Tomsk)

Oil & Purlite S957 Resin + Uranium

WM-4 Vacuum pump oil / Natural Uranium Concentrate



U.S. DOE Labs

- Mound, Ohio
 - Oil with H₃
- Rocky Flats, Colorado
 - Decommissioning
 - All waste streams with Pu contamination
- Oak Ridge / TRU Project
 - Contact handled TRU waste for glove box solidification
 - Special polymer blend; bonding ratio .75 liquid : 1 polymer
 - Ongoing for more than 10 years
- Los Alamos
 - Oils, acids and alkaline waste
- Idaho
 - Super compaction liquids, wide range of compositions
- Argonne
- Savannah River

China – China Institute of Atomic Energy

- CIAE conducted formal test program in 2005
 - One of China's first technical papers published and presented at global conferences with a foreign partner
 - Oil, TBP, nitric at 0 pH, alkaline at 14 pH, saturated resin beads
 - Extensive irradiation and compression tests
- China Academy of Engineering Physics (# 9), Sichuan
 - Oil with tritium (solidification survived earthquake)
- 2008, first full-scale production project completed
- Evaluation and test programs underway
 - # 404 national repository in Gansu province
 - # 821, waste treatment facility in Sichuan province
- CIAE is our formal partner; works with NPP's, institutes and military sites; recognized as best nuclear lab in China

China

TBP at 3:1 ratio Resin Beads in Water



Decommissioning Projects

- USA
 - Mound, Ohio
 - Rocky Flats, Colorado
- UK
 - Harwell
- Kazakhstan
 - Mangystau Atomic Energy Combine, Aqtau (Caspian Sea)
- Italy
 - SOGIN, Bosco Marengo
- Canada
 - Whiteshell Labs (Canadian Nuclear Labs)

Medical Radioactive Waste

- Slovenia – ARAO, regulator
 - Collects all liquid medical waste from generators
 - Waste varied by container; toluene, acetonitrile, water, ethanol and methanol
 - H-3, tritium contamination
 - N910, N960 & N935 applied
 - N935 critical to the success of the project
 - Small batch process due to non-uniformity of waste
 - 1 : 1 solidification ratio, safe for interim storage on site
 - Thick polyethylene bags for storage
 - Project started 2013, project completed 2015

Vista Nuclear Solutions



Scientific Research on Polymer Technology

- Radiation & thermal stability
 - Differential Thermal Analysis
 - Radiation
- Gas generation
- Compression
- Leaching
 - Cement and sulfur-inorganic materials
- Fire and safety
- Evaporation
- Specialty waste streams: Tritium, TBP, nitric acid, TRU
- Problematic streams: highly synthetic oil, fresh acid -o- level pH

Radiation and Thermal Stability

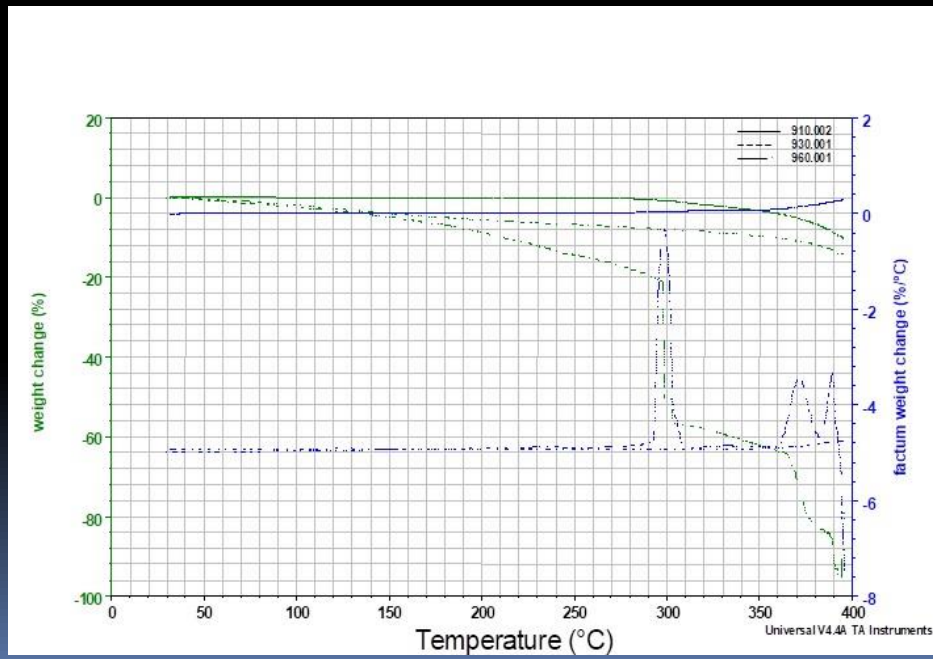
- All Cobalt 60, gamma source tests
 - Primary focus of all test programs
 - U.S., Russia and China: results are all the same
 - 2.7 million gray on organic / acid waste (Russia)
 - .3 gray per second / 30 days = 770,000 gray + 73 days = 2.7 m gray
 - 90,000 gray on TBP-organic waste (DOE Savannah River)
 - 75,000 gray on Hanford simulant, 14.2 pH
- No degradation of polymer or waste form
 - 2.7 million gray, petrified, no liquid
- Differential Thermal Analysis
 - Polymers have high resistance to heat
 - Decomposition begins around 250C
- Polymers are not gas generators

Irradiation Tests
50% nitric / 50% organic stream



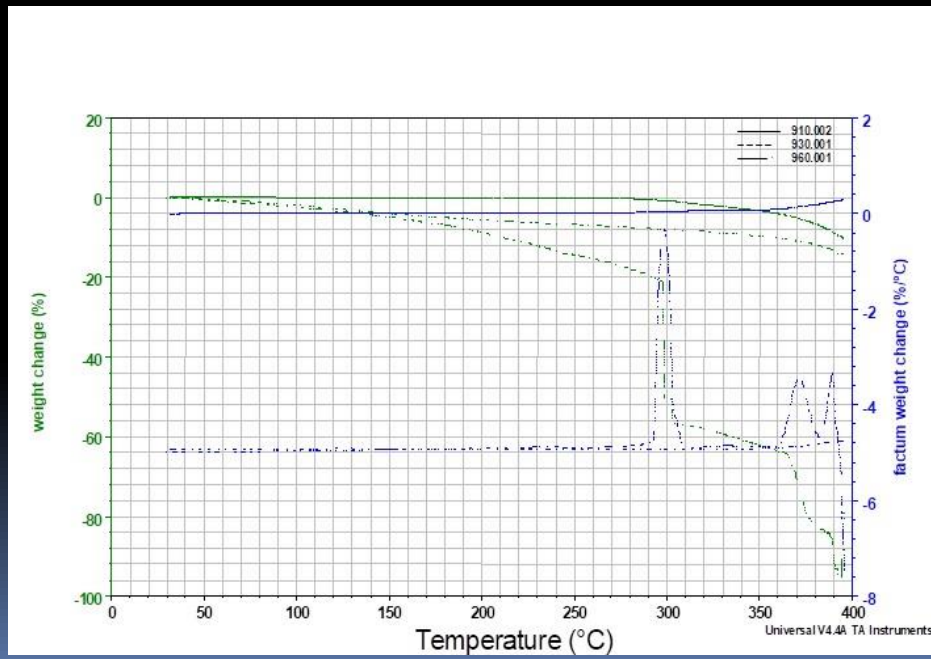
Vista Nuclear Solutions

Differential Thermal Analysis
Solidified nitric acid and sodium nitrate
samples with N910, N930 and N960 polymers

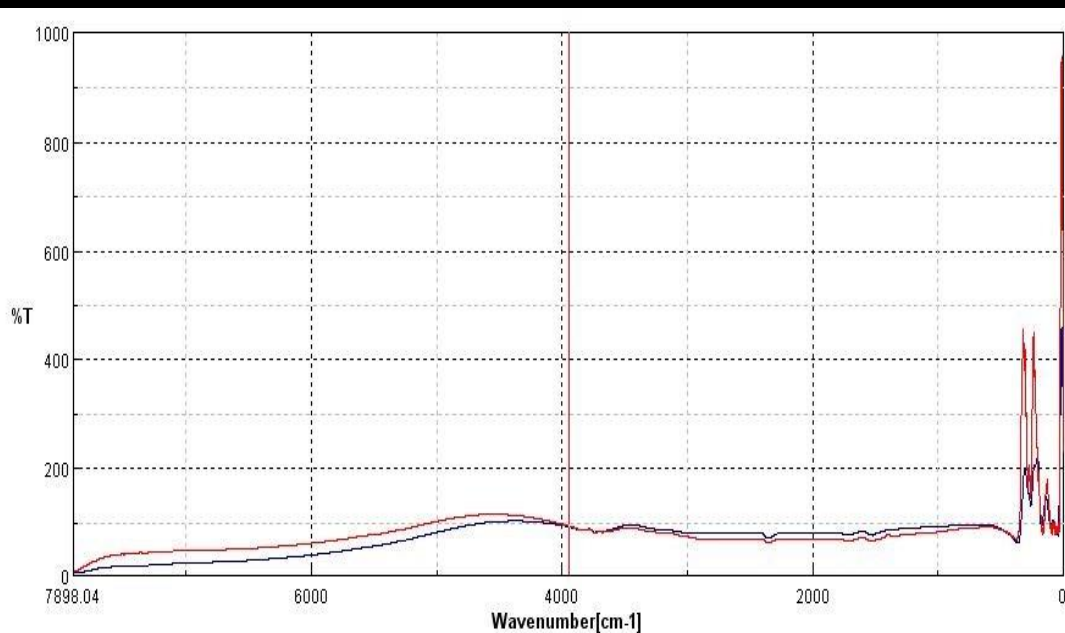


Vista Nuclear Solutions

Differential Thermal Analysis
Solidified nitric acid and sodium nitrate
samples with N910, N930 and N960 polymers



IR Spectragraph – N910 Polymer
Blue line represents before irradiation
Red line represents after irradiation



Disposal Options

- Solidification, direct to carbon steel drums
 - Inner liner: Highly integrated container (HIC)
 - Plastic lined drum
 - U.S. and Canada
- Solidification, for encapsulation in cement
 - Homogeneous matrix
 - Heterogeneous matrix
- Solidification for Incineration
 - Polymer generates 0.02% ash
 - Solidified waste (oil) generates less than 5% ash
- New technology, encapsulation in sulfur & inorganic materials (patent with Argonne National Lab)

Disposal Options

- Nochar provides flexible options after solidification
 - Immobilize liquid form for safety and security on site
 - Hold for temporary storage
 - Interim storage, 5-20 years for cementation at a later date
 - Incineration at a later date
 - Final storage
- Cementation
- Incineration
- Compliance with national regulations

Incineration

- Europe
 - Belgoprocess, Belgium
 - Cyclife France
 - Cyclife Sweden
 - Javys Slovakia

Cementation

- USA
 - Pacific Northwest Labs, uranium chips in oil
- U.K.
 - Harwell, ILW aqueous waste
- France
 - AREVA, homogeneous matrix
- Italy
 - Bosco Marengo, sludge
- Russia
 - Khlopin RI, ILW, TBP-organic
 - Heterogeneous matrix
- Estonia
 - ASA.L.A.R.A, organic streams, homogeneous matrix
- Slovakia
 - NPP VUJE, Dowtherm oil

SOGIN, Italy Cementation

- Oil sludge: oil & water, 55%, solids & other 45%
- Classified as VLLW / LLW
- 1.5 cubic meters
- Process:
 - Pre-treat with Ng10 (solidify oil)
 - Mixing, 10 minutes with Ng10 and sludge
 - Solidification with cement, 20 minutes
 - Homogeneous matrix in cement in 220L drums
 - Cement overpack
- Project completed, December, 2021

Vista Nuclear Solutions



Vista Nuclear Solutions



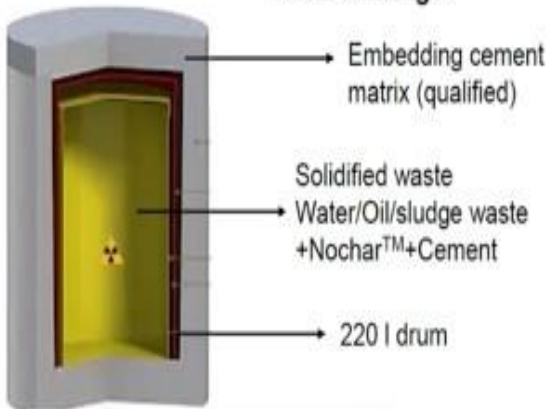
Vista Nuclear Solutions



Oily waste – the final package

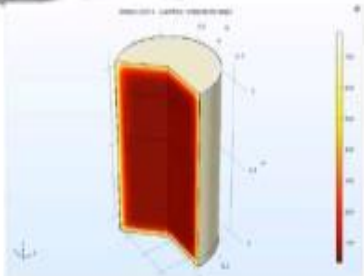


Final Package



In order to comply with the acceptance criteria for the final disposal to the National Repository, the solidified waste (into 220 liters drum) is than **embedded in cement inside an overpack.**

The embedding cement matrix has been subjected to a complete set of qualification tests.

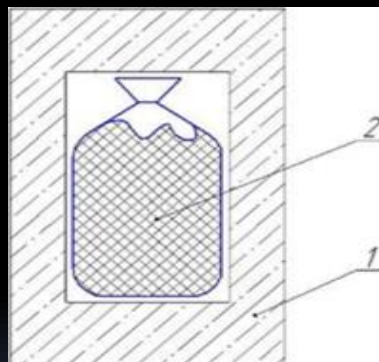


Assessments for the verification of the potential production of gas by radiolysis and of the behavior of the package if exposed to high temperatures.

LoC ready to be submitted:

*verification of preliminary
WAC and Disposability
Assessment completed*

Cementation Encapsulation Russia Approved Package



Russia: Final Disposal at LSK
Sosnovy Bor Repository, St. Petersburg



Technical Issues with Aqueous Polymer and Cement Encapsulation

- Ng10 with organic streams works well
 - "Oatmeal" form best for homogeneous matrix
 - Solid – large brick type form may cause compression issues
 - AREVA, passed 80 bar compression for ANDRA approval
- Ng60 polymer
 - Super absorbent, when applied at high %, can destroy cement
 - Sludge types: 30% water, should work – requires testing
 - Harwell project, worked well at high bonding ratio, 100% aqueous stream. Could depend on the process applied

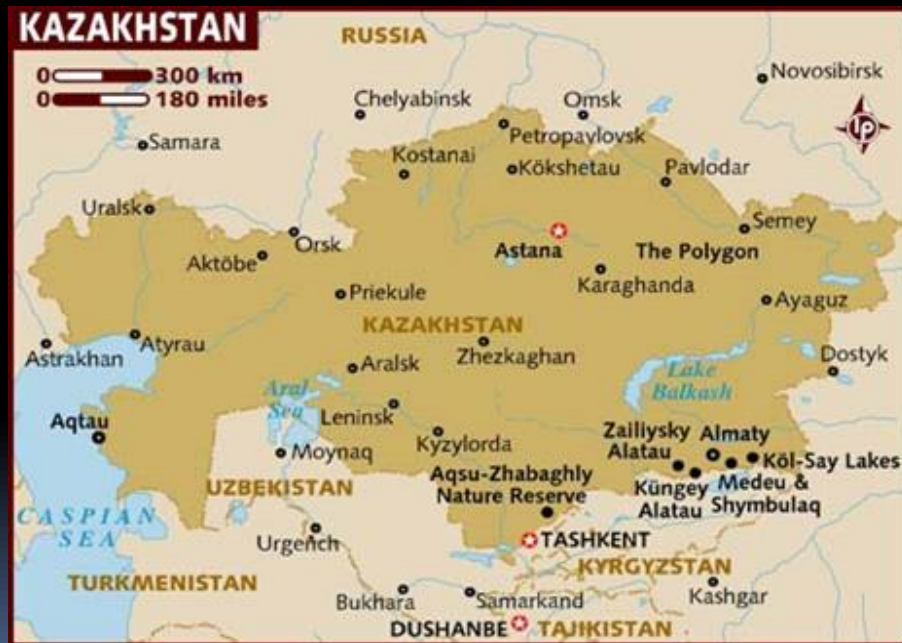
Incineration

- Romania -Cernavoda NPP
 - Cyclife, Studsvik, Sweden
 - Belgoprocess, Belgium
 - More than 40 MT of oil, scint fluids with H₃
 - Less than 5% ash, returned to NPP
- Slovenia -Krsko NPP
 - Studsvik, since 2003
- France, approved at Centraco-Socodei
 - OranoSTMI (AREVA)
 - OnetTechnologies
- China
 - Testing underway at # 404 (national repository) and #821

Kazakhstan

- U.S. DOE sponsored, 2-year project at former plutonium (weapons grade) production site
 - Argonne National Lab, partner
 - 26 weapons scientists / engineers
 - Lead institute: Nuclear Science and Technology Center
- Atomic Energy Combine
 - BN-350 fast neutron reactor facility
- Full decommissioning, 3,500 MT of liquid waste
 - Contamination: Cs-137, Sr-90, U-235/238, P239
 - Total activity: 9,618 Ci
 - Oil, sodium hydroxide and high salt-aqueous sludge
 - Above ground tanks
- Invention created: new encapsulation design
- U.S. patent received, 2018: owned by Argonne

Kazakhstan: Atomic Energy Combine

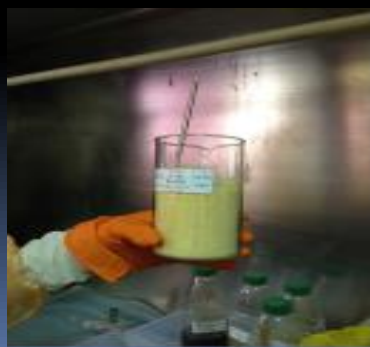


Radiation Resistant Composite (RRC) Sulfur and Inorganic Materials

- Two step process for oil– organic liquid
 - Solidification with Ng10
 - Encapsulation with sulfur and inorganic materials
- Volume of oil: 60 wt.%
 - Compared to 25-30% in cement
- Compressive strength of 100 kg/cm²
- Argonne concludes that RRC outperforms cement as encapsulation form for final waste treatment
 - Meets U.S. NRC requirements
- Limitations with aqueous liquids

Vista Nuclear Solutions

Sodium Hydroxide at 14 pH, N960 at 3:1
Machine Oil, N910 at 3:1



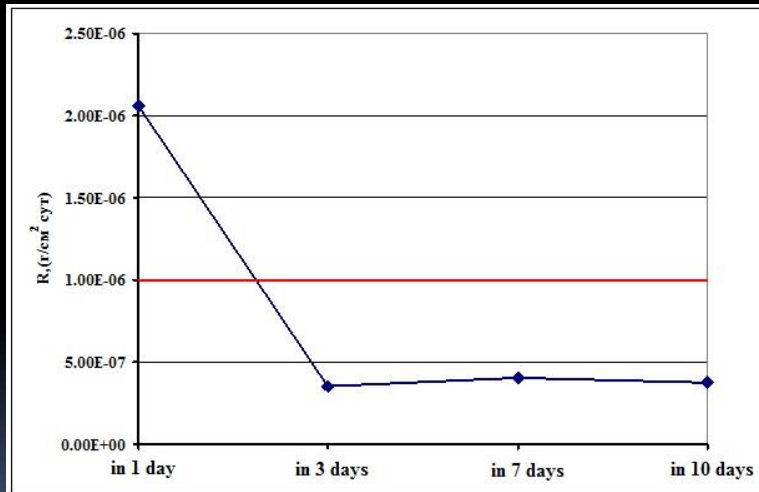
Forms of RRC materials



- Sulfur Composite- Final Form
Polymer solidification at 3:1 ratio
Hot molding with RRC materials at 100
Polymerization process
Density at 1.4 g/cm³ (rubbery solid form)

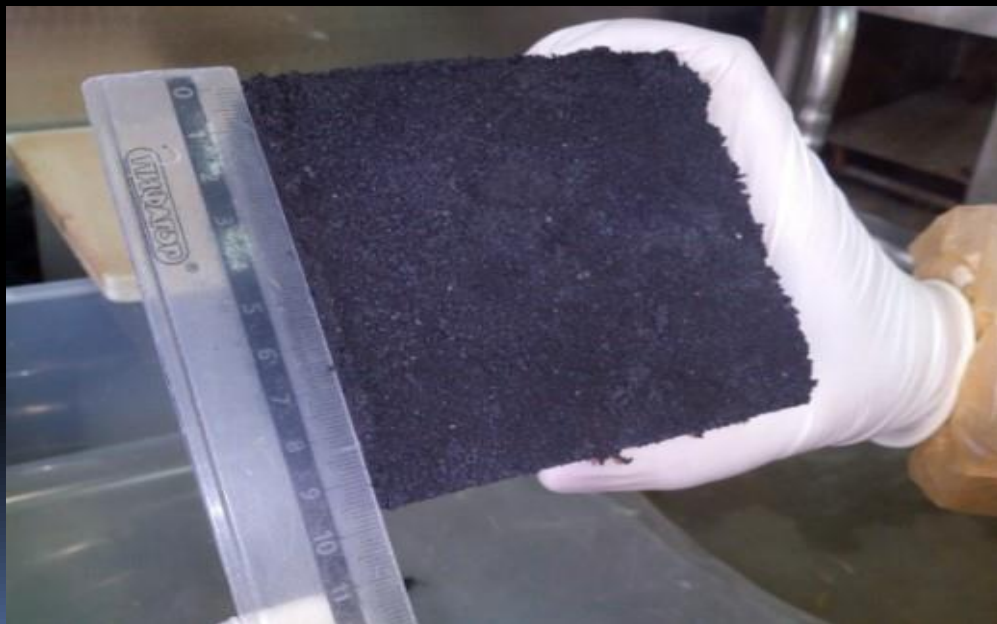


Leach Test Results for RRC Passed Russian GOST Requirements



Vista Nuclear Solutions

Sulfur Composite with Radioactive Oil
Solidified with N910



Initial Volume of Oil Immobilized (30 ml)
Sample of Sulfur Composite Containing
65% by Volume of Oil





nochar, inc.

nature's partner in fire and environmental protection

Nochar Material Safety Data Sheet / SDS

MSDS No: N910 Trade Secret

Version No: 1/3/2022

Nochar, Inc. 1311 W 96th Street, Suite 235
Indianapolis, IN 46260

317-613-3046

Emergency Assistance

For emergency assistance involving chemicals call

765-938-3333

Vista Nuclear Solutions

MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N910 TRADE SECRET

1. IDENTIFICATION OF THE SUBSTANCE/PREPERATION AND THE COMPANY

Product Name: N910
Company: Nochar, Inc.
1311 W 96th Street
Suite 235
Indianapolis, IN 46260

Telephone: 317-613-3046

Telefax: 317-613-3052

E-mail: nochar@nochar.com

Emergency Information: 765-938-3333

Product Use: Solidification of hazardous and non-hazardous hydrocarbon liquids

2. COMPOSITION/INFORMATION ON INGREDIENTS

Identification of the Preparation: Thermoplastic Elastomer Polymer

3. HAZARDS IDENTIFICATION

Human Health Hazards: None

Environmental Hazards: None

Vista Nuclear Solutions

Safety Hazards: Electrostatic charges may be generated during handling. Risk of self-ignition of bulk product above certain temperatures (Refer to Section 10) dust explosion could occur.

Special Notes: These components are synthetic rubber compounds, which are essentially nontoxic. Material is non-irritating. If polymer dusts are generated, they could scratch the eyes and cause minor irritation to the respiratory tract.

4. FIRST AID MEASURES

Inhalation: If dust is inhaled, obtain medical attention.

Skin Contact: Wash off immediately with soap and plenty of water. In case of persistent skin irritation, consult a physician.

Eye Contact: Rinse thoroughly with plenty of water, also under the eyelids. In case of persistent eye irritation consult a physician.

Ingestion: None.

Advice to Physician: Treat symptoms.

REVISION DATE 1/3/2022

MATERIAL SAFETY DATA SHEET (SDS) NOCHAR'S N910

5. FIRE-FIGHTING MEASURES

NFPA 704 Hazard Class: Health: 0 Flammability: 1 Instability: 0

Unsuitable Extinguishing Media: Water in spray may disperse fire.

Extinguishing Media: Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.

Specific Hazards: Not flammable but will burn. Combustion products may include carbon monoxide and carbon dioxide.

Special Protective Equipment for Firefighters: Full protective clothing and self contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Avoid generating dust.

Environmental Precautions: None.

Methods for Cleaning Up: Clean up promptly by scoop or vacuum. Keep in suitable, closed containers for disposal as required by local, state, federal, international or country specific regulations.

7. HANDLING AND STORAGE

Safe Handling Advice: Avoid generation of dust. Take precautionary measures against static discharges, earth/ground all equipment. Do not breathe dust. Use local exhaust over processing area. When processing N910 products, maintain a fire watch if the material reaches 225 deg. C (536 deg. F)

Storage: Keep in a dry, cool place. Avoid storage under pressure or at elevated temperatures to minimize particulate clustering.

Storage Temperature. Ambient

Product Transfer: Take precautionary measures against static discharge. Earth/Ground all equipment.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Measures: Use local exhaust ventilation.

Nuisance Dust TLV: TWA (8 h) 10 mg/m³ if dust is generated.

Personal Protective Equipment:

Vista Nuclear Solutions

Respiratory Protection: In case of insufficient ventilation wear suitable respiratory equipment.

Hand Protection: Cloth gloves are recommended.

Eye Protection: Safety glasses with side shields. Do not wear contact lenses where this product is used.

Skin and Body Protection: No special protective clothing required.



Illustration - 201534979



MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N910

9. PHYSICAL AND CHEMICAL PROPERTIES

Form: Solid

Color: White

Odor: Essentially odorless

Flash Point: None

Specific Gravity: ≤ 1

Auto Ignition Temperature: Does not ignite.

Bulk Density (for solids): Typical 300-400 kg/m³ at 20 Deg. C

Loose Density: Approximately 18 lbs per cu.ft.

Water Solubility: Insoluble

10. STABILITY AND REACTIVITY

Stability: Stable under ambient conditions.

Materials to Avoid: Oxidizing agents may cause exothermic reactions.

Hazardous Decomposition Products: Thermal decomposition may produce Carbon oxides (CO_x)

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Oral: Expected to be of low toxicity. LD50 ≥ 2000 mg/kg.

Dermal: Expected to be of low toxicity. LD50 ≥ 2000 mg/kg.

Inhalation: The product is not expected to be toxic by inhalation.

Irritation

Skin: Not expected to be irritating.

Eyes: Not expected to be irritating.

Sensitization: Not sensitizing

Mutagenicity: No data available, but not expected. This product is not classified by the following: The International Agency for Research on Cancer (IARC), The National Toxicology Program (NTP) or The American Conference of Governmental Industrial Hygienists (ACGIH).

MATERIAL SAFETY DATA SHEET (SDS) NOCHAR'S N910

12. ECOLOGICAL INFORMATION

Mobility: Floats on water. Remains on surface of soil.

Aquatic Toxicity

Toxicity to Fish: Expected to be non toxic. LC/EC/IC 50 \geq 1000 mg/l.

Toxicity to Invertebrates: Expected to be non toxic. LC/EC/IC 50 \geq 1000 mg/l.

Toxicity to Algae: Expected to be non toxic. LC/EC/IC 50 \geq 1000 mg/l.

Toxicity to Bacteria: Expected to be non toxic. LC/EC/IC 50 \geq 1000 mg/l.

Sewage Treatment: Expected to be non toxic. LC/EC/IC 50 \geq 1000 mg/l.

13. DISPOSAL CONSIDERATIONS

Waste from Residues / Unused Products: In accordance with Federal, State, local and national regulations.

Contaminated Packaging: Can be land filled or incinerated, when in compliance with local regulations.

14. TRANSPORT INFORMATION

Vista Nuclear Solutions

Not classified as dangerous in the meaning of transport regulations. **DOT, IMDG/IMO, ICAO/IATA. UN, IMO, ADR/RID, ICAO CODE**

Harmonized Tariff System (HTS): 3901.90

Export Administration Regulations: Does not require a license EAR 99

15. REGULATORY INFORMATION

This product is not classified as dangerous and need not to be labeled according to EC-DIRECTIVES as amended.

International Inventories:

European Union (EINECS/ELINCS): All components of this product are either listed on the inventory or are exempt from listing.

USA (TSCA): All components of this product are either listed on the inventory or are exempt from listing.

Canada (DSL): All components of this product are either listed on the inventory or are exempt from listing.

Australia (AICS): All components of this product are either listed on the inventory or are exempt from listing.

CHINA (IECSC): All components of this product are either listed on the inventory or are exempt from listing.

JAPAN (IENCS): All components of this product are either listed on the inventory or are exempt from listing.

MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N910

Vista Nuclear Solutions

KOREA (KECI): All components of this product are either listed on the inventory or are exempt from listing.

NEW ZEALAND (NZIOC): All components of this product are either listed on the inventory or are exempt from listing.

This document is compliant with the Globally Harmonized System (GHS) for the classification, labeling, and packaging (CLP) of substances and mixtures.

EU Reach Article 29 (Requirements for Safety Data Sheets) and Japan Ministry of Economy, Trade, and Industry (METI), Ministry of Health, Labor, and Welfare (MHLW) and Ministry of the Environment (MOE).

EU Regulation (EC) 1907/2006 REACH: Polymers are exempted from registration and evaluation. Therefore Nochar Products are exempted by regulation. Annex V exempts from registration additives used in our polymers as antioxidants, defoaming agents, stabilizers, etc.,

EU Directive 94/62/EC Hazardous Waste: Not regulated

EU Directive 94/62/EC as amended by 2004/12/EC (Packaging and packaging waste): Not regulated, The product meets the requirement for the total amount of cadmium, chromium, lead and mercury to be less than 100 parts per million.

EU Directive 2000/53/EC as amended in 2002 (End of life vehicle): Not regulated

EU Directive 2037/2000 Ozone Depleters (Class I or II) as defined in Montreal Protocol: Not regulated

UNITED STATES: FEDERAL REGULATIONS

Toxic Substances Control Act (TSCA) Section 4,5(a)(2), (e),(f), 6,7 or 12(b): Not regulated

Clean Air Act Amendments Section 602 (Class I or II) Ozone Depleters: Not regulated

Clean Air Act Section 111 Volatile Organic Compounds (VOC): Not regulated

Clean Air Act 112 Hazardous Air Pollutants (HAP): Not regulated

Clean Water Act Section 307 Priority Pollutants: Not regulated

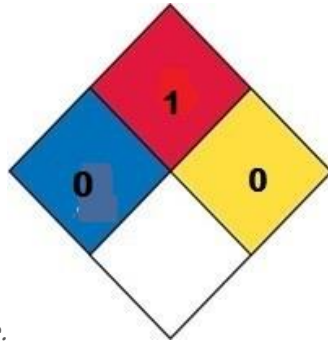
UNITED STATES: STATES REGULATIONS

Right-to-Know Laws (Massachusetts, New Jersey, New York State, Pennsylvania): Not regulated

Vista Nuclear Solutions

Coalition of Northeastern Governors (CONEG): Not regulated. The product meets the requirement for the total amount of cadmium, chromium, lead and mercury to be less than 100 parts per million.

This information contained herein is based on the data available to us and is believed to be correct. However, the manufacturer makes no warranty, expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof, and assumes no responsibility for injury from the use of the product described herein. The manufacturer assumes no liability for incidental, consequential or direct damage of any manner or kind, regardless of



cause, including negligence.



nochar, inc.

nature's partner in fire and environmental protection

Nochar Material Safety Data Sheet / SDS

MSDS No: N935 TRADE SECRET

Version No: 1/3/2022

Nochar, Inc. 1311 W 96th ST Suite 235, Indianapolis, IN 46260

Vista Nuclear Solutions

317-613-3046

Emergency Assistance

For emergency assistance involving chemicals call

765-938-3333

MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N935 TRADE SECRET

Vista Nuclear Solutions

1. IDENTIFICATION OF THE SUBSTANCE/PREPERATION AND THE COMPANY

Product Name: N935

Company: Nochar Inc.
1311 W 96th Street
Suite 235
Indianapolis, IN 46260

Telephone: 317-613-3046

Telefax: 317-613-3052

E-mail: nochar@nochar.com

Emergency information: 765-938-3333

Product Use: Solidification of Hazardous & Non-Hazardous Materials

2. COMPOSITION/INFORMATION ON INGREDIENTS

Identification of the Preparation: Co-Polymer of Acrylamide / Acryl ate

3. HAZARDS IDENTIFICATION

The Product when wet renders surfaces extremely slippery. The Product swells in water.

4. FIRST AID MEASURES

Inhalation: No hazards which require special first aid measures.

Vista Nuclear Solutions

Skin Contact: No hazard which requires special first aid measures.

Eye Contact: Rinse thoroughly with plenty of water, also under the eyelids. In case of persistent eye irritation consult a physician.

Ingestion: The Product is not considered toxic based on studies on laboratory animals.

MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N935

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Water. Foam. Carbon dioxide (CO₂). Dry powder. Water spray.

Precautions: The product when wet renders surfaces extremely slippery. The product swells in water.

Vista Nuclear Solutions

Special Protective Equipment for Firefighters: Wear self-contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: No special precautions required.

Environmental Precautions: As with all chemical products, do not flush into surface waters.

Methods for Cleaning Up: Clean up promptly by sweeping or vacuum, Keep in suitable, closed containers for disposal. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Safe Handling Advice: Avoid contact with skin and eyes. Avoid dust formation. Do not breathe vapors/dust. Wash hands before breaks and at the end of workday.

Storage: Keep in a dry, cool place (0 - 35° C).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Measures: Use local exhaust if dusting occurs. Natural ventilation is adequate in absence of dust.

Personal Protective Equipment:

Respiratory Protection: Dust safety masks recommended where working powder concentration is more than 10 mg/m³.

Hand Protection: Gloves are recommended.

Vista Nuclear Solutions

Eye Protection: Safety glasses with side shields. Do not wear contact lenses where this product is used.

Skin and Body Protection: No special protective clothing required.

Hygiene Measures: Wash hands before breaks and at end of workday. Handle in accordance with good industrial hygiene and safety practice.



skintouch 201504979



MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N935

9. PHYSICAL AND CHEMICAL PROPERTIES

Form: Granular solid

Color: White

Flash point: Not applicable

Boiling Point (°C): Not applicable

Auto Ignition Temperature: Not applicable

Vapor Pressure: Not applicable

Water Solubility: Insoluble

Bulk density: 0.76 – 0.82 Grams per cubic centimeter

10. STABILITY AND REACTIVITY

Stability: Stable. Hazardous polymerization does not occur.

Materials to Avoid: The product swells in water.

Hazardous Decomposition Products: Thermal decomposition may produce hydrogen cyanide (hydrocyanic acid), nitrogen oxides (NO_x), Carbon oxides (CO_x)

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Oral: Not toxic. LD50/oral/rat ≥ 5000 mg/kg.

Skin: Not toxic.

Irritation

Skin: Not irritating.

Eyes: Moderate eye irritation due to effects all powders have on conjunctivae.

Sensitization: Not sensitizing

MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N935

12. ECOLOGICAL INFORMATION

Aquatic Toxicity

Toxicity to Fish: Aquatic toxicity is unlikely due to low solubility.

Toxicity to Daphnia: Aquatic toxicity is unlikely due to low solubility.

Toxicity to Algae: Aquatic toxicity is unlikely due to low solubility.

Environmental Fate

Persistence and Degradability: Not readily biodegradable.

Hydrolysis: Does not hydrolyze.

Bioaccumulation: Does not bio-accumulate.

13. DISPOSAL CONSIDERATIONS

Waste from Residues / Unused Products: In accordance with local and national regulations.

Vista Nuclear Solutions

Contaminated Packaging: Can be land filled or incinerated, when in compliance with local regulations.

14. TRANSPORT INFORMATION

Not classified as dangerous in the meaning of transport regulations.

Harmonized Tariff System (HTS): 3906.90

15. REGULATORY INFORMATION

This product is not classified as dangerous and need not to be labeled according to EC-DIRECTIVES as amended.

International Inventories:

European Union (EINECS/ELINCS): Existing polymer according to the definition in the 7th Amendment to Directive 67/548/EEC/ All starting materials and additives are listed in EINECS.

USA (TSCA): Complies with all applicable rules and orders under TSCA.

MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N935

16. OTHER INFORMATION:

Further Information.

NOT MEANT FOR HUMAN CONSUMPTION

This MSDS was prepared in accordance with the following:

Council Directive 92/32/EEC of 30 April 1992 amending for the seventh time Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances and all subsequent adaptations to technical progress.

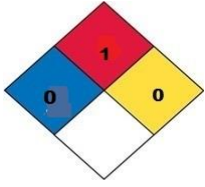
Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labeling of dangerous preparations.

Commission Directive 2001/58/EC of 27 July 2001 amending for the second time Directive 91/155/EEC defining and laying down the detailed arrangements for the system of specific information relating to dangerous preparations in implementation of Article 14 of European Parliament and Council Directive 1999/45/EC and relating to dangerous substances in implementation of Article 27 of Council Directive 67/548/EEC and relating to dangerous substances in implementation of Article 27 of Council Directive 67/548/EEC (Safety Data Sheets).

ISO 11014-1: Material Safety Data Sheet for Chemical Products.

This information contained herein is based on the data available to us and is believed to be correct. However, the manufacturer makes no warranty, expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof, and assumes no responsibility for injury from the use of the product described herein. The manufacturer assumes no liability for incidental, consequential or direct damage of any manner or kind, regardless of cause, including negligence.

Vista Nuclear Solutions



REVISION DATE: 1/3/2022



nochar, inc.

nature's partner in fire and environmental protection

Nochar Material Safety Data Sheet / SDS

MSDS No: N960 TRADE SECRET

Version No: 1/3/2022

Nochar, Inc. 1311 W 96th Street, Suite 235

Indianapolis, IN 46260

Vista Nuclear Solutions

(1317) 613-3046

Emergency Assistance

For emergency assistance involving chemicals call
765-938-3333

MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N960 TRADE SECRET

Vista Nuclear Solutions

Product name: N960

Company: Nochar Inc.
1311 96th Street
Suite 235
Indianapolis, IN 46260

Telephone: 317-613-3046

Telefax: 317-613-3052

E-mail: nochar@nochar.com

Emergency information: 765-938-3333

Product Use: Solidification of Hazardous & Non Hazardous Materials

2. COMPOSITION/INFORMATION ON INGREDIENTS

Identification of the preparation: Co-Polymer of Acrylamide

3. HAZARDS IDENTIFICATION

The Product when wet renders surfaces extremely slippery. The Product swells in water.

4. FIRST AID MEASURES

Inhalation: No hazards which require special first aid measures.

Skin Contact: No hazard which requires special first aid measures.

Vista Nuclear Solutions

Eye Contact: Rinse thoroughly with plenty of water, also under the eyelids. In case of persistent eye irritation consult a physician.

Ingestion: The Product is not considered toxic based on studies on laboratory animals.

REVISION DATE : 1/3/2022

MATERIAL SAFETY DATA SHEET (SDS) NOCHAR'S N960

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Water. Foam. Carbon dioxide (CO₂). Dry powder. Water spray.

Precautions: The product when wet renders surfaces extremely slippery. The product swells in water.

Special Protective Equipment for Firefighters: Wear self-contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: No special precautions required.

Environmental Precautions: As with all chemical products, do not flush into surface waters.

Vista Nuclear Solutions

Methods for Cleaning Up: Clean up promptly by sweeping or vacuum, Keep in suitable, closed containers for disposal. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Safe Handling Advice: Avoid contact with skin and eyes. Avoid dust formation. Do not breathe vapors/dust. Wash hands before breaks and at the end of workday.

Storage: Keep in a dry, cool place (0 - 35° C).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Measures: Use local exhaust if dusting occurs. Natural ventilation is adequate in absence of dust.

Personal Protective Equipment:

Respiratory Protection: Dust safety masks recommended where working powder concentration is more than 10 mg/m³.

Hand Protection: Gloves are recommended.

Eye Protection: Safety glasses with side shields. Do not wear contact lenses where this product is used.

Skin and Body Protection: No special protective clothing required.

Hygiene Measures: Wash hands before breaks and at end of workday. Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form: Granular solid

Color: White

Flash point: Not applicable

Boiling Point (°C): Not applicable

Auto Ignition Temperature: Not applicable

Vapor Pressure: Not applicable

Water Solubility: Insoluble

Bulk density: 0.75 – 0.80 grams per cubic centimeters

10. STABILITY AND REACTIVITY

Stability: Stable. Hazardous polymerization does not occur.

Materials to Avoid: The product swells in water.

Hazardous Decomposition Products: Thermal decomposition may produce hydrogen cyanide (hydrocyanic acid), nitrogen oxides (NO_x), Carbon oxides (CO_x)

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Oral: Not toxic. LD50/oral/rat \geq 5000 mg/kg.

Skin: Not toxic.

Irritation

Skin: Not irritating.

Eyes: Moderate eye irritation due to effects all powders have on conjunctivae.

Sensitization: Not sensitizing

MATERIAL SAFETY DATA SHEET (SDS)

NOCHAR'S N960

12. ECOLOGICAL INFORMATION

Aquatic Toxicity

Toxicity to Fish: Aquatic toxicity is unlikely due to low solubility.

Toxicity to Daphnia: Aquatic toxicity is unlikely due to low solubility.

Toxicity to Algae: Aquatic toxicity is unlikely due to low solubility.

Environmental Fate

Persistence and Degradability: Not readily biodegradable.

Hydrolysis: Does not hydrolyze.

Bioaccumulation: Does not bio-accumulate.

13. DISPOSAL CONSIDERATIONS

Waste from Residues / Unused Products: In accordance with local and national regulations.

Contaminated Packaging: Can be land filled or incinerated, when in compliance with local regulations.

14. TRANSPORT INFORMATION

Not classified as dangerous in the meaning of transport regulations.

Harmonized Tariff System (HTS): 3906.90

15. REGULATORY INFORMATION

This product is not classified as dangerous and need not to be labeled according to EC-DIRECTIVES as amended.

International Inventories:

European Union (EINECS/ELINCS): Existing polymer according to the definition in the 7th Amendment to Directive 67/548/EEC/ All starting materials and additives are listed in EINECS.

Vista Nuclear Solutions

USA (TSCA): Complies with all applicable rules and orders under TSCA.

MATERIAL SAFETY DATA SHEET (SDS) NOCHAR'S N960

16. OTHER INFORMATION: _____

Further Information.

NOT MEANT FOR HUMAN CONSUMPTION

This MSDS was prepared in accordance with the following:

Council Directive 92/32/EEC of 30 April 1992 amending for the seventh time Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances and all subsequent adaptations to technical progress.

Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labeling of dangerous preparations.

Commission Directive 2001/58/EC of 27 July 2001 amending for the second time Directive 91/155/EEC defining and laying down the detailed arrangements for the system of specific information relating to dangerous preparations in implementation of Article 14 of European Parliament and Council Directive 1999/45/EC and relating to dangerous substances in implementation of Article 27 of Council Directive 67/548/EEC and relating to dangerous substances in implementation of Article 27 of Council Directive 67/548/EEC (Safety Data Sheets).

Vista Nuclear Solutions

ISO 11014-1: Material Safety Data Sheet for Chemical Products.

Nochar's MSDS-SDS comply with GHS Global Harmonized Standards for the Classification and labeling

Chemicals

This information contained herein is based on the data available to us and is believed to be correct. However, the manufacturer makes no warranty, expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof, and assumes no responsibility for injury from the use of the product described herein. The manufacturer assumes no liability for incidental, consequential or direct damage of any manner or kind, regardless of cause, including negligence.