

Sulfolane Chemical Compatibility Comparison Table

Rating Definition

A: Excellent Compatibility, stable long-term at ambient/process temperature, no corrosion, swelling, dissolution or reaction

B: Conditional Compatibility, usable for short-term contact; slight corrosion, swelling or discoloration at high temperature/long-term exposure/high water content, regular monitoring required

C: Restricted Use, only short-term low-temperature contact, prone to severe swelling, corrosion, discoloration and degradation

D: Completely Incompatible, mixing/long-term contact strictly prohibited; risk of exothermic reaction, decomposition, material swelling/destruction and violent reaction

I. Metal Material Compatibility (Equipment, Storage Tanks, Pipelines, Heat Exchangers)

表格

Material	Pure Sulfolane at Ambient Temp	Pure Sulfolane at High Temp 150–220°C	Water-containing / Acidic Degraded Sulfolane	Overall Rating	Application Notes
Carbon Steel Q235	A	B	C	B	Storage tanks, main extraction towers; maintain acid value <0.3 and oxygen blanketing; pitting corrosion occurs with elevated acid value
304 Stainless Steel	A	A	A	A	Regeneration towers, heat exchangers, filters, pump internals, universal

Material	Pure Sulfolane at Ambient Temp	Pure Sulfolane at High Temp 150–220°C	Water-containing / Acidic Degraded Sulfolane	Overall Rating	Application Notes
316L/317L Stainless Steel	A	A	A	A	preferred material Lithium battery, pharmaceutical high-purity working conditions, high-acid degraded solvent systems Tower trays and internal components;
0Cr13 Ferritic Stainless Steel	A	A	B	B	accelerated corrosion in water-containing acidic systems Usable for pure anhydrous sulfolane;
Aluminum/Aluminum Alloys	A	A	B	B	oxidative corrosion occurs in water-containing/acidic environments
Copper/Brass/Red Copper	A	B	C	C	Short-term ambient use only; rapid blackening and catalytic decomposition at

Material	Pure Sulfolane at Ambient Temp	Pure Sulfolane at High Temp 150–220°C	Water-containing / Acidic Degraded Sulfolane	Overall Rating	Application Notes
Zinc, Magnesium	A	C	D	D	high temperature with trace oxygen Corrosion occurs at high temperature/water content; strictly prohibited for high-temperature equipment
Titanium	A	A	A	A	Severe corrosion conditions, high-purity electronic grade solvent systems
Borosilicate Glass/Quartz	A	A	A	A	Laboratory reaction kettles, sampling bottles, chromatographic pipelines

II. Rubber/Elastomer Seals (Gaskets, O-Rings, Pump Mechanical Seals)

表格

Seal Material	Pure Anhydrous Sulfolane	Sulfolane + Water/Amine/Carbonate Mixed Liquid	Rating	Application Recommendations
FKM Fluoroelastomer (Viton)	A	A	A	Universal standard seal for industrial, lithium battery and polymerization

Seal Material	Pure Anhydrous Sulfolane	Sulfolane + Water/Amine/Carbonate Mixed Liquid	Rating	Application Recommendations
Kalrez Perfluoroelastomer		A	A	processes, no long-term high-temperature swelling Optimal seal for ultra-high-purity lithium battery and pharmaceutical high-temperature kettles Usable for pure sulfolane at ambient temperature; moderate swelling when mixed with carbonate/aromatics
EPDM Ethylene Propylene Diene Monomer	A	B	B	Rapid swelling, hardening and cracking; long-term use prohibited
NBR Nitrile Butadiene Rubber	C	D	D	Swelling and degradation; not recommended
CR Neoprene Rubber	C	D	D	Temporary low-temperature sealing only, long-term swelling and leakage
Silicone Rubber	B	C	C	

Seal Material	Pure Anhydrous Sulfolane	Sulfolane + Water/Amine/Carbonate Mixed Liquid	Rating	Application Recommendations
Butyl Rubber	B	C	C	Only temporary gaskets for short-term low-temperature pure solvent contact
PU Polyurethane	D	D	D	Complete dissolution and damage; contact forbidden

III. Plastic/Polymer Linings & Pipes, Filter Membranes

表格

Plastic Material	Compatibility Rating	Working Condition Notes
PVDF Polyvinylidene Fluoride	A	Preferred material for high-temperature, water-containing, high-purity lithium battery pipelines and filter membranes
PTFE Polytetrafluoroethylene	A	Fully inert for all temperatures and mixed systems
PEEK Polyetheretherketone	A	Sulfolane is the synthesis solvent for PEEK, no dissolution occurs
PP Polypropylene	B	Usable for pure sulfolane at ambient temperature; slight swelling and deformation above 100°C
HDPE High-Density Polyethylene	B	Ambient temperature drum storage, temporary transportation; softening and swelling at high temperature
PVC Rigid Polyvinyl Chloride	C	Short-term room-temperature contact only, dissolution and cracking at high temperature
ABS/PS Polystyrene	D	Rapid dissolution and cracking; contact forbidden

Plastic Material	Compatibility Rating	Working Condition Notes
PMMA Polymethyl Methacrylate	D	Dissolution and fogging; strictly prohibited Usable for pure solvent at ambient temperature; blistering and peeling in high-temperature/acidic degraded solvent
Epoxy Resin Coating	B	Slow erosion at high temperature
Phenolic Resin	C	

IV. Organic Chemical Miscibility & Reaction Compatibility (Core Incompatibility Guidelines)

1. Fully Miscible (Grade A, Normal Mixing & Extraction Allowed)

Water, methanol, ethanol, isopropanol, ethylene glycol, toluene, xylene, benzene, ethylbenzene, acetone, MEK, cyclohexanone, aniline, pyridine, MDEA/MEA amines, mercaptans, thiophenes, acetic acid, ethyl acetate, dichloromethane, chloroform

2. Stably Coexistent with Restrictions (Grade B, Mixable at Ambient Temp, Side Reactions Likely at High Temperature; Temperature/Oxygen Control Required)

Dilute hydrochloric acid, dilute sulfuric acid (<10%), 25% dilute NaOH aqueous solution, potassium carbonate, sodium carbonate, inorganic salts (LiPF₆, LiTFSI, sodium acetate), toluene/xylene water-carrying agents (polymerization process)

Control Requirements: Isolate oxygen, temperature ≤180°C, avoid long-term reflux

3. Restricted Use Systems (Grade C, Only Short-Term Low-Temperature Contact, Risk of Discoloration & Slow Degradation)

Concentrated NaOH (>40%), concentrated hydrochloric acid, concentrated phosphoric acid, metal Mg/Zn powder, Grignard reagents (ethylmagnesium bromide), long-term high-temperature reflux of low-boiling halogenated hydrocarbons

Phenomenon: Solvent yellowing, trace acidic impurities generated, halogenated sulfolane by-products formed

4. Strictly Forbidden Coexistence (Grade D, Violent Reaction, Exotherm, Decomposition, Gas Generation & Combustion/Explosion Risk; Mandatory Segregated Storage)

1. Strong Oxidants: Potassium permanganate, dichromate, hydrogen peroxide, peroxides, chlorine, liquid bromine, fluorine, nitric acid, chlorate, perchlorate, nitration reagents (nitronium tetrafluoroborate); mixing causes sharp exotherm, SO₂ release and deflagration risk
2. Super Strong Acid Media: Fuming sulfuric acid, chlorosulfonic acid, sulfur trioxide; violent exothermic decomposition of sulfolane upon mixing
3. Active Metals: Metal Na, K, Li (strictly control trace water in lithium battery systems to prevent gas generation)
4. Strong Halogenating Agents: Phosphorus pentachloride, phosphorus tribromide; ring-opening halogenation with massive heat release

V. Inorganic Acids, Alkalis & Salts Compatibility Summary Table

表格

Chemical Category	Rating	Restriction Conditions
Dilute Weak Acids (Acetic Acid, Carbonic Acid)	A	Stable at all temperatures with no reaction
Dilute Mineral Acids (HCl/H ₂ SO ₄ <10%)	B	Trace degradation with long-term high-temperature exposure; control oxygen content
Concentrated Strong Acids, Fuming Sulfuric Acid	D	Violent exothermic decomposition; mixing prohibited
Dilute Alkali Solution (10–25% NaOH)	B	Stable for short-term reflux; slow acidification with long-term heating
Concentrated Strong Alkali (>40% NaOH/KOH)	C	Long-term heating generates acidic degradation products
Neutral Inorganic Salts (Carbonates, Acetates, Lithium Salts)	A	Stable dissolution for lithium battery and synthesis processes
Heavy Metal Ions (Fe ³⁺ , Cu ²⁺)	C	Catalyze oxidative blackening of sulfolane; online filtration required for industrial systems

VI. Industry-Specific Rapid Material Selection Guide (Direct On-Site Application)

1. Aromatic Extraction / Natural Gas Desulfurization Units

Tanks/Main Pipelines: Carbon steel (maintain acid value <0.3 with nitrogen blanketing); Heat Exchangers/Regeneration Towers/Filters: 304/316L; Seals: FKM Fluoroelastomer

2. PEEK/PI High-Temperature Polymerization Kettles
Kettle Body: 316L / Titanium; Lining: PTFE; Gaskets: Kalrez/PTFE wrapped gaskets; Pipelines: PVDF/316L
3. Lithium Battery Electronic Grade Electrolyte Compounding
Full Process: 316L + PVDF pipelines, PTFE valves, Kalrez seals; carbon steel, copper and ordinary EPDM strictly excluded
4. Fine Pharmaceutical Synthesis
Glass-lined reaction kettles / 316L equipment, PTFE/FKM seals; long-term use of ordinary carbon steel prohibited
5. Storage & Transport Drums
Short-term ambient storage: HDPE plastic drums; Long-term storage tanks: Carbon steel with nitrogen blanketing; High-purity products: Stainless steel storage tanks

VII. Compatibility Red Line Warnings (Workshop Mandatory Regulations)

1. Sulfolane must not be stored or transported in the same warehouse/vehicle with strong oxidants, fuming sulfuric acid and concentrated nitric acid; minimum separation distance of 5 meters required
2. Copper and zinc components are forbidden for high-temperature solvent circulation systems above 120°C ; they accelerate solvent blackening and degradation
3. NBR, PU, ABS and PS materials are absolutely prohibited for seals, pipelines and linings
4. Simultaneous presence of water, high temperature and oxygen increases carbon steel corrosion rate by 10 times; corrosion inhibitor dosing + online deacidification resin are mandatory