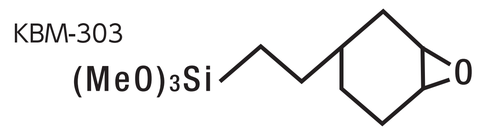
Silicones for Epoxy Resin Modification

KBM-303, KBM-403 Monomer Type

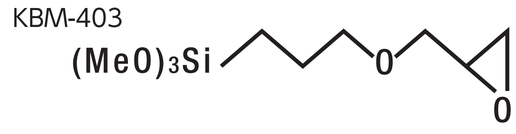
Two types are available: glycidyl and cycloaliphatic.

■ Chemical structure

KBM-303



KBM-403



■ Features and benefits

Features	Benefits
Containing epoxy groups	Increased strength and durability owing to improved adhesion

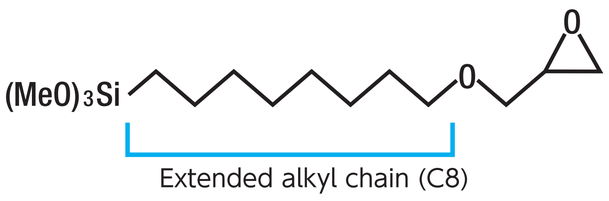
■ Epoxy silane application resins

Resins / Organic functional groups	Thermoplastic resin										Thermosetting resin							Elastomeric rubber						
	Polyethylene	Polypropylene	Polystyrene	Acrylic	PVC	Polycarbonate	Nylon	Urethane	PBT・PET	ABS	Melamine	Phenol	Epoxy	Urethane	Polyimide	Diallyl phthalate	Unsaturated polyester	Furan	Polybutadiene rubber	Nitrile rubber	Epichlorohydrin rubber	Neoprene rubber	Butyl rubber	Polysulfide	Urethane rubber
Epoxy	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+		+	+	+

KBM-4803 Long-chain Spacer Type

Extended spacers (alkyl chain) between Si and organic functional groups exhibit the following features and advantages.

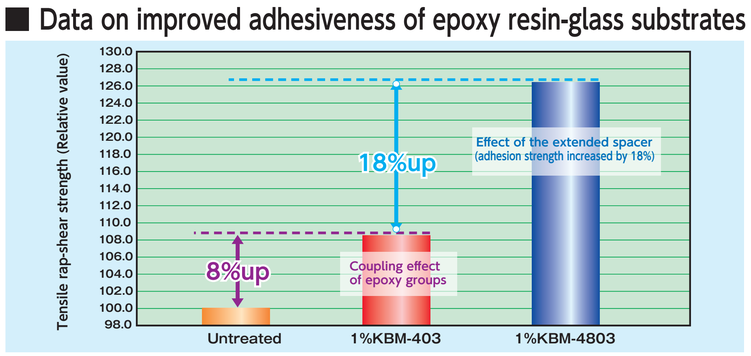
■ Chemical structure



■ Features and benefits

Features By alkyl chain extension (C8)	Benefits
Improved hydrophobicity	Improved dispersibility of inorganic filler (Lower viscosity and high loading are possible.)
	Imparting water and alkali resistance
Improved flexibility	Imparting flexibility

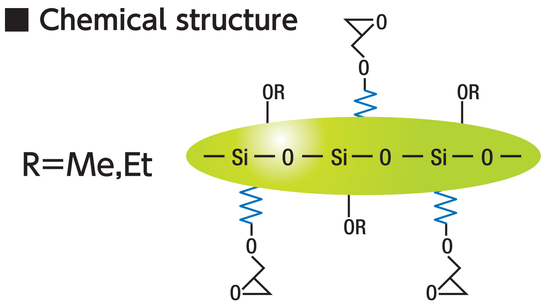
■ Data on improved adhesiveness of epoxy resin-glass substrates



KR-516 and KR-517 siloxane Type

Oligomerization offers the following advantages.

■ Chemical structure



■ Features and benefits

Features	Benefits
A large number of functional groups and excellent reactivity	Increased strength and durability owing to improved adhesion
Low volatility	Excellent stability of the reaction
Main chain is a siloxane skeleton.	Excellent heat and light resistance

■ Volatility data compared to monomer type

Product name	Volatile content %		
	105℃×3h	150℃×3h	180℃×3h
KR-516	7	15	20
KBM-403	34	96	-

(Not specified values)

X-12-1056ES Protected Functional Group Type

Mercapto groups enhance adhesion to metal substrates and contribute to further improvement of corrosion protection of the epoxy resin.

■ Chemical structure

■ Features and benefits

Features	Benefits
Protected mercapto groups	Improved formulation stability
Reduced odor	Improved working environment
Mercapto group generation	Improved adhesion to metals

■ Cured epoxy resin test data

By using protected functional group type, physical properties of the cured epoxy resin improves.

Parameter	run1 (KBM-803)	run2 (X-12-1056ES)
Bending strength	100	113
Flexural modulus	100	107
Adhesion (silver plated substrates)	100	120
Adhesion (Pd plated substrates)	100	120
High temperature and humidity reliability	±	+

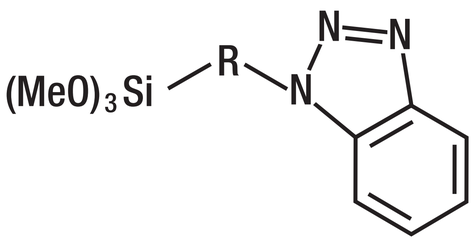
* Relative values when the run1 is 100

(Not specified values)

X-12-1214A Benzotriazole-containing Type

Benzotriazole improves the rust resistance of metal substrates and contributes to further improvement in the corrosion resistance of epoxy resins.

■ Chemical structure



■ Features and benefits

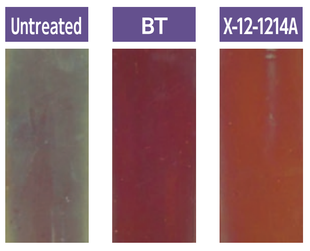
Features	Benefits
Alkoxy group attached to benzotriazole	Long-term metal rust prevention (especially for copper, silver, and aluminum)

■ Anti-rust treatment on copper plates

●Heat resistance test

❶Allow to stand 5 h in a 150℃ thermostatic oven.

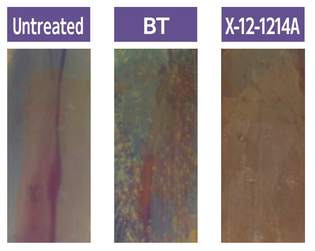
❷Observe the surface of the copper plate.



●Sulfuric corrosion test

❶Immersion in 100 ppm Na_2S solution for 5 min.

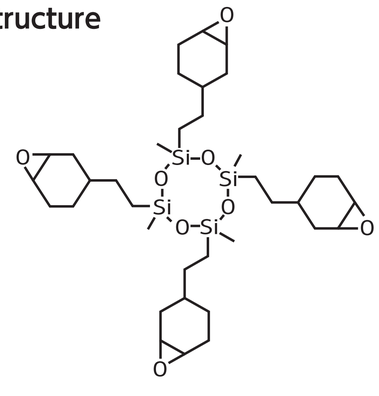
❷Observe the surface of the copper plate after drying.



KR-470 Cyclic Siloxane Type

KR-470 has heat resistance and high Tg peculiar to siloxane, and shrinkage is low when cured.

■ Chemical structure



■ Features and benefits

Features	Benefits
Alicyclic epoxy groups	High reactivity, high Tg
Siloxane back bone	Excellent heat and light resistance
Cyclic siloxane structure	Low cure shrinkage
Single structure	Excellent compatibility and easy control of reactivity

■ Comparison with epoxy resins