

**AS-13395**

CAS Number 4420-74-0

3-Mercaptopropyltrimethoxysilane (MPTMS)

The essential silane for silica–rubber bonding in green tyres and corrosion–protective coatings

Overview

MPTMS carries a thiol (–SH) group at one end, capable of reacting with gold, copper, rubber vulcanisation agents (via thiol–disulphide exchange), and radical–active systems. The trimethoxysilyl group anchors to glass, silica, and metal oxide surfaces. This dual reactivity makes MPTMS indispensable in tyre manufacture – it is used to couple hydrophilic silica filler to the hydrophobic rubber matrix, simultaneously improving rolling resistance and wet grip without compromising abrasion resistance. In anti-corrosion coatings it forms dense, cross-linked films on steel and aluminium.

Key applications

- Silica–rubber bonding in 'green tyre' compounds – reduces rolling resistance and fuel consumption while improving wet grip
- Anti-corrosion silane pretreatment for mild steel and aluminium in marine and industrial environments
- Gold electrode surface modification for biosensors and molecular electronics
- UV-curable nanocomposite coatings – mercapto group enables thiol-ene photopolymerisation with nanosilica
- Heavy metal scavenging – MPTMS-functionalised mesoporous silica selectively adsorbs mercury, lead, and cadmium
- Adhesion promotion in rubber-to-metal bonding for industrial seals and vibration dampers

Selected literature

[1] Xavier J.R. (2022). MPTMS/WC nanoparticle-reinforced epoxy nanocomposite coatings for marine corrosion protection. *Silicon* 14. <https://doi.org/10.1007/s12633-022-01842-0>

[2] Al-Saadi S. & Singh Raman R.K. (2022). Silane Coatings for Corrosion Resistance of Mild Steel: A Review. *Materials* 15, 7809. <https://doi.org/10.3390/ma15217809>

[3] Liu S. et al. (2023). MPTMS polyorganosiloxane nanoparticles for photoinitiated thiol-ene nanocomposite films. *Polymer Composites* (2021, PMC8326481). <https://pmc.ncbi.nlm.nih.gov/articles/PMC8326481/>

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