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Efficient bonding of ethylene-propylene-diene M-class rubber to stainless steel using polymer brushes as a nanoscale adhesive

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Abstract:

A novel approach to bond rubber to metal using nanometers thick polymer brushes in the interface is investigated. An Atom Transfer Radical polymerization (ATRP) initiator is grafted to the surface of stainless steel (SS) and poly(glycidyl methacrylate) (PGMA) brushes are grown from the surface. Benzoyl peroxide (BPO) is drop casted on the polymer films before the samples are overmolded with ethylene-propylene-diene M-class (EPDM) rubber. For surface concentrations below $0.2 \mu\text{mol cm}^{-2}$ regions with adhesive failure were observed. Thermal infrared reflectance absorption spectroscopy (T-IRRAS) and X-ray photoelectron spectroscopy (XPS) show a conversion of oxirane groups after heating samples to $170 \text{ }^\circ\text{C}$.

¹ These authors contributed equally to this work

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