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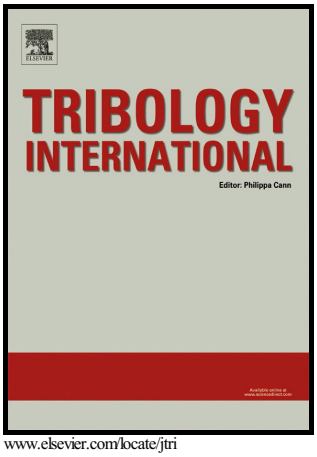

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Distinct tribological mechanisms of silica nanoparticles in epoxy composites reinforced with carbon nanotubes, carbon fibers and glass fibers

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Abstract

The effects of silica nanoparticles on the tribological behaviors of epoxy (EP) composites reinforced with carbon nanotubes (CNT), short carbon fibers (SCF) and short glass fibers (SGF) were comprehensively investigated and compared. It was revealed that the tribological mechanisms of nanoparticles were distinct in EP composites filled with various reinforcements. Silica enhanced the wear resistance of CNT-reinforced EP, whereas no synergy between CNT and silica was identified. Nevertheless, SCF and silica played a synergetic role in enhancing the tribological performance. However, the addition of silica into SGF-reinforced EP exerted a negative effect. Owing to distinct tribo-physical and chemical actions between rubbing reinforcements and counterface, the presence of silica nanoparticles on the interface generated transfer films with different structures and functionalities.

Keywords: Silica nanoparticles; Carbon nanotubes; Transfer film; Tribological mechanism