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Kinetics of Nanoparticles Release from Nanocomposites Exposed to Environmental Stresses

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Nanocomposites are increasingly used in essentially every segment of the industry from consumer products to aerospace. Regardless the application, both the long-term performance of the composite itself and the fate of the nanomaterials in the matrix during the product's life cycle play a key role in the commercialization and uses of these nanocomposite products. The main reason for that is nanomaterials that were embedded in the polymer matrices may be released from the nanocomposites during their life cycles. Little data is available about the fate of free or embedded nanoparticles, how they may be released, and the quantity/composition/structure of the released particles throughout the product's life cycle. The goal of this study is to investigate the process and mechanism of particle release from nanocomposites under accelerated UV exposure. Specimens of a nanosilica composite were exposed to a well-controlled, accelerated UV environment, and the amount of nanosilica particles from the degraded surface were collected using a simulated rain process, and measured using inductively-coupled plasma optical emission spectroscopy as a function of UV exposure time at different temperatures. This result will be valuable for developing a kinetics model to predict the long term release of nanosilica from polymer nanocomposites when used outdoors.

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