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An overview of theoretical approaches to characterize the self-healing behavior of microcapsule-embedded polymeric composites

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ABSTRACT

In recent years, many studies have focused on the incorporation of microcapsules in the polymer matrix for the development of self-healing composite materials (White et al. 2001). The embedded microcapsules in the polymer matrix are ruptured when crack nucleation occurs, and then the microcracks are healed by polymerization (White et al. 2001). However, many of the relevant studies have investigated the effect of microcapsules on the enhanced mechanical properties of the composites (Brown et al. 2002), while fewer efforts were given to theoretically investigating the self-healing behavior of microcapsule-embedded polymeric composites. Moreover, accurate prediction of the self-healing behavior of the composites is difficult due to the various shapes and sizes of the intersection of microcapsules and microcracks (Wang et al. 2022). In this regard, this paper revisits the previous studies of microcapsule-embedded polymeric composites and provides reviews on the theoretical approaches to characterize the self-healing behavior of the composites. In addition, a preliminary study conducted by the authors to investigate the self-healing behavior of microcapsule-embedded polymeric composites is briefly introduced (Jin et al. 2022).

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