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Editorial corner – a personal view
Self-healing ability of epoxy coating application

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Epoxy resins are versatile thermosetting polymers, which were first used for surface coatings in the 1940s, and later in the 1950s, they were introduced to the paint industry. Since then, tremendous growth has been observed in this area. (https://www.crcpress.com/9780824776909). At present, epoxy resins are widely used for making advanced composites, coatings, adhesives, electrical and electronic equipment. Among various applications, ca. 50% of epoxy resins are used for coating applications such as automobile, food/drink can, coil, marine, pipeline, construction coatings, etc., which give longer lasting products.

The epoxy resins are conventionally manufactured by mixing epichlorohydrin with either bisphenol-A, bisphenol-F or phenolic novolac, and the products obtained (diglycidyl ether of bisphenol-A, bisphenol-F or epoxy phenolic novolac) may be used for different applications depending on their performance. These coatings have excellent processability, low shrinkage on cure, long pot life period, good thermomechanical properties, excellent adhesion, gloss, good chemical resistance, corrosion resistance, light weight and cheaper. Nevertheless, the major drawback of conventional epoxy protective coatings is that they are nonrenewable, brittle, toxic, highly flammable, and not repairable. Recently, several studies have focused on green epoxy coatings from renewable resources especially from vegetable oils, lignin, rosin etc. They are preferred over the conventional bisphenol-A based coatings because the bioepoxy resin is nontoxic. On the other hand, the toughness and flexibility of the epoxy coatings can be improved by the incorporation of liquid natural rubbers, and block copolymers. (https://doi.org/10.1007/978-3-319-40043-3). The flammability can be controlled by using brominated epoxy coatings, or by the incorporation of aluminum hydroxide in the coatings etc. Self-healing offers self-repairing of minor cracks, which delivers better performance. Self-healing in epoxy coatings can be achieved by the encapsulation of corrosion inhibitor and polymeric healing agents in micro and nanocontainers. (https://doi.org/10.3144/expresspolymlett.2016.48). The flow of healing agents from the micro and nanocontainers to the crack sites is initiated by external stimuli such as mechanical damage, change in pH, pressure, and temperature (https://doi.org/10.1016/j.nanoso.2018.09.010). However, this method has a drawback of one-time healing. Multiple healing in epoxy coatings can be achieved by introducing reversible crosslinks in the epoxy networks (https://doi.org/10.1021/acs.macromol.8b01010). Conversely, multiple self-healing ability of epoxy coatings with 100% efficiency is still a challenge. The concepts of reversible crosslinking could be an ideal platform for developing multiple self-healing epoxy coatings and has lots of room for improvement.

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