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Review

The use of polyurethane for structural and infrastructural engineering applications: A state-of-the-art review

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HIGHLIGHTS

- Novel ways of using polyurethane for structural and infrastructural applications have increased.
- The mechanical response of polyurethane can be described as hyper-viscoelastic.
- Polyurethane coatings provide enhanced environmental, chemical and physical resistance.
- High stiffness-to-weight ratio results broad structural composite application.
- Polyurethane spread through several substrate by creating matrix within the substrate.

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ABSTRACT

Polyurethane (PU) is one of the largest polymer products in the plastic family. Structural and non-structural applications of PU and its variants have become a common and effective method for repair, strengthening, rehabilitation, and protection of civil engineering infrastructure in the past decades. A wide variety of PU products have been used for such application, among these products are castable elastomers, rigid and flexible foams, coatings, fiber and fabrics, adhesives, sealants, thermoplastics, and millable gums. PU is a highly promising and versatile material because of its attractive morphology and wide range of desirable mechanical properties, made possible by the ability to alter its microstructure to suit niche applications. In addition, PU can be easily synthesized with minimal techniques and can be applied on a wide range of surface types because of its essential bond characteristics with several substrates, as well as its self-supporting feature that does not require additional adhesive. This review addresses the state-of-the-art published literature on PU and its utilization in structural and infrastructural applications comprehensively, in terms of engineering properties, protective coatings, utilization in composite applications, and in strengthening and retrofitting of structural elements with PU and their modified products.

Contents

Abbreviations: PU, polyurethane; CPI, Center for the Polyurethanes Industry; EVA, ethyl vinyl acetate; EPS, expanded polystyrene; PIB, polyisobutylene; PMMA, polymethylmethacrylate/acrylic; PP, Polypropylene; PVC, Polyvinylchloride.

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