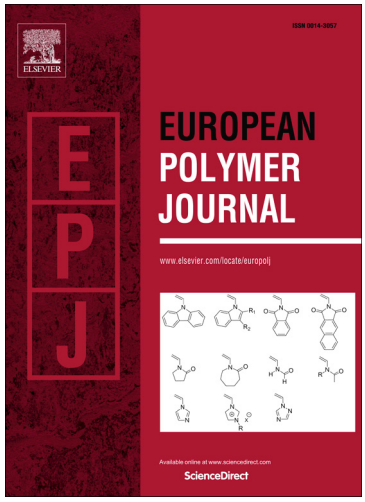

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X-ray induced cationic curing of epoxy-bonded composites

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ABSTRACT

The present work investigates the feasibility of an X-ray based approach towards the curing of high temperature resistant epoxy-bonded ceramic composites with large wall diameters. In contrast to other irradiation methods such as UV and e-beam, X-rays can penetrate deeply into solid materials. The calculated and measured penetration depth of X-rays in state of the art ceramic materials showed that this method is suitable to cure composites with a wall thickness up to 20 cm. To produce composites with sufficient mechanical properties, resin formulations based on epoxy novolacs and photolabile initiators (photoacid generators) were developed. The cationic curing behavior of these systems was investigated under UV illumination as well as under X-ray irradiation. It is demonstrated that X-ray processing of high temperature resistant ceramics provides a novel and viable method to cure high density composites. Compared to conventional thermal curing, the X-ray based process offers the benefit of lower overall energy consumption and higher curing speed, thus enabling a significantly faster throughput in the industrial production.

Keywords: X-ray; cationic curing; photopolymerization, epoxide

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