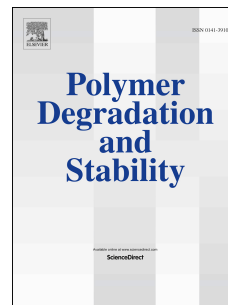


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WATER AGEING OF URETHANE DIMETHACRYLATE NETWORKS

Benjamin POMES^{1,2,3}, Isabelle DERUE³, Albert LUCAS³, Jean-François NGUYEN^{1,2,4}, Emmanuel RICHAUD^{3*}

1. UFR d'Odontologie, Université Paris Diderot, Paris, France
2. Service d'Odontologie Groupe Hospitalier Pitié Salpêtrière, Paris, France
3. Arts et Métiers ParisTech, Laboratoire de Procédés et Ingénierie en Mécanique et Matériaux (PIMM), CNRS, CNAM, UMR 8006, 151 Boulevard de l'Hôpital, Paris, France
4. PSL Research University, Chimie ParisTech CNRS, Institut de Recherche de Chimie Paris, Paris, France

* corresponding author : emmanuel.richaud@ensam.eu

ABSTRACT

This work explores the process of water ageing of high-temperature high-pressure polymerized urethane dimethacrylate (UDMA) networks. UDMA samples polymerized under several pressures (0.1 to 300 MPa) and differing by the conversion degree of polymerization were aged in water at 37, 50 and 70°C and followed by gravimetry. Diffusion was observed to obey Fick's law. The diffusion coefficient and water maximal uptake were observed to be almost independent of polymerization pressure, consistently with analysis of Dynamic Vapor Sorption data suggesting that external polymerization pressure has no effect on polymer affinity with water. This was ascribed to the fact that all materials have the same cohesive energy, as confirmed by ultrasonic measurements of elastic moduli. Polymerization pressure (used to improve conversion degree and mechanical properties) would thus have a minor influence on water ageing that is mainly triggered by polymer chemistry. When elevating the polymerization pressure, there is hence no compromise between the optimization of thermo-mechanical properties and the resistance to water ageing.

KEYWORDS: Urethane Dimethacrylate (UDMA), Water aging, Diffusion, Dynamic Vapor Sorption

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