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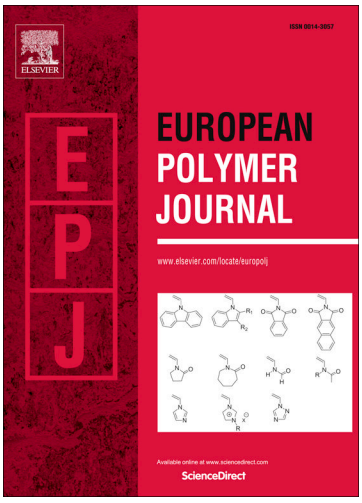

Dynamic crosslinking of silicone elastomer: Radical branching controlled by thermo-oxidation under shearing

T. Métivier, E. Beyou, P. Cassagnau

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Dynamic crosslinking of silicone elastomer: Radical branching controlled by thermo-oxidation under shearing

T. Métivier, E. Beyou, P. Cassagnau*

Univ Lyon, University of Lyon 1, Ingénierie des Matériaux Polymères, CNRS UMR 5223, 15 Bd Latarjet, 69622 Villeurbanne, France

* philippe.cassagnau@univ-lyon1.fr

ABSTRACT: Methylvinyldimethylsiloxane copolymer elastomer was crosslinked under static and dynamic conditions with several amounts of peroxide. For samples crosslinked in static conditions, the insoluble fractions and the shear equilibrium moduli have been observed in a good agreement with theories of network elasticity. As regards the dynamically crosslinked samples, the rheological and SEC analysis have revealed that the crosslinking reaction gives rise to multi-scale branched structures with molecular structures achieving 10^7 g/mol and proved that these samples remain soluble and processable. Moreover, dynamic crosslinked samples also show a strain hardening behavior even in bi-elongational flows. Furthermore, experiments under nitrogen and air atmospheres were carried out to better understand the mechanisms of the formation of these branched structures. The results suggest that molecular oxygen lowers the consumption of vinyl groups inhibiting the crosslinking reaction. Finally, the rheological behavior may be explained by the original microstructure composed of un-crosslinked chains playing the role of the matrix while the miscible and branched structures of macromolecules act as reinforcement agent.

Keywords: Silicone, rheology, radical crosslinking, thermo-oxidation, dynamic crosslinking.