

Characterization of Filled HNBR Elastomers for Sealing Application in Cold Climate Areas

Authors : Anton G. Akulich, Avinash Tiwari, Ben Alcock, Andreas Echtermeyer

Abstract : Low temperatures are known to pose a major threat for polymers; many are prone to excessive stiffness or even brittleness. There is a technology gap between the properties of existing elastomeric sealing materials and the properties needed for service in extremely cold regions. Moreover, some aspects of low temperature behaviour of rubber are not thoroughly studied and understood. The paper presents results of laboratory testing of a conventional oilfield HNBR (hydrogenated nitrile butadiene rubber) elastomer at low climatic temperatures above and below its glass transition point, as well as the performance of some filled HNBR formulations. Particular emphasis in the experiments is put on rubber viscoelastic characteristics studied by Dynamic Mechanical Analysis (DMA) and quasi-static mechanical testing results at low temperatures. As demonstrated by the stress relaxation and DMA experiments the transition region near T_g of the studied compound has the most striking features, like rapid stress relaxation, as compared to the glassy and rubbery plateau. In addition the quasi-static experiments show that molecular movement below T_g is not completely frozen, but rather evident and manifested in a certain stress decay as well. The effect of temperature and filler additions on typical mechanical and other properties of the materials is also discussed.

Keywords : characterization, filled elastomers, HNBR, low temperature

Conference Title : ICPC 2016 : International Conference on Polymers and Composites

Conference Location : Madrid, Spain

Conference Dates : March 24-25, 2016