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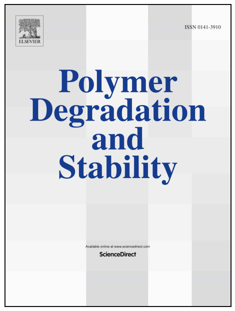

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Effect of lubricating oil on thermal aging of nitrile rubber*

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Abstract: Nitrile rubber (NBR) was thermally aged in air, a commercial lubricating oil, and its corresponding base oil. During thermal aging, changes in the volatile components of NBR, including additives from NBR and the commercial lubricating oil, and the chemical structure of NBR, including functional groups and crosslinking density, were studied by using pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS), attenuated total reflection-Fourier transform infrared spectroscopy (ATR-FTIR) and time domain nuclear magnetic resonance (TD-NMR). The migration of additives and the degree of oxidation and crosslinking of NBR in different media were compared. Three effects of lubricating oil—a barrier effect, consumption of oxygen, and permeation—on thermal aging of NBR were examined. Base oil protected the rubber from serious oxidation and crosslinking due to the barrier effect and consumption of oxygen. In contrast, the commercial oil accelerated the aging of NBR by extracting and reacting with the additives from NBR and permeating into the rubber to promote oxidation and crosslinking of the rubber chains. The presence of additives in the commercial oil was the main reason for the different performances. These results were meaningful for using NBR products in lubricating oil conditions.

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