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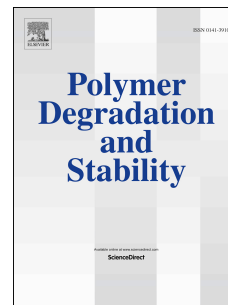
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1 **Effect of lubricating oil on thermal aging of nitrile rubber**^{*}2 Xuan Liu^a, Jiaohong Zhao^a, Rui Yang^{a,†}, Rossana Iervolino^b, Stellario Barbera^b3 ^aDepartment of Chemical Engineering, Tsinghua University, Beijing 100084, P. R. China4 ^bEngineering and Research Center, SKF B. V., Kelvinbaan 16, 3439 MT Nieuwegein, the
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7 **Abstract:** Nitrile rubber (NBR) was thermally aged in air, a commercial lubricating
8 oil, and its corresponding base oil. During thermal aging, changes in the volatile
9 components of NBR, including additives from NBR and the commercial lubricating
10 oil, and the chemical structure of NBR, including functional groups and crosslinking
11 density, were studied by using pyrolysis-gas chromatography-mass spectrometry (Py-
12 GC-MS), attenuated total reflection-Fourier transform infrared spectroscopy (ATR-
13 FTIR) and time domain nuclear magnetic resonance (TD-NMR). The migration of
14 additives and the degree of oxidation and crosslinking of NBR in different media were
15 compared. Three effects of lubricating oil—a barrier effect, consumption of oxygen,
16 and permeation—on thermal aging of NBR were examined. Base oil protected the
17 rubber from serious oxidation and crosslinking due to the barrier effect and
18 consumption of oxygen. In contrast, the commercial oil accelerated the aging of NBR
19 by extracting and reacting with the additives from NBR and permeating into the
20 rubber to promote oxidation and crosslinking of the rubber chains. The presence of
21 additives in the commercial oil was the main reason for the different performances.
22 These results were meaningful for using NBR products in lubricating oil conditions.

23

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