RELATIONSHIP BETWEEN CHEMICAL AND MECHANICAL MODIFICATION DURING OXIDATION OF CHLOROPRENE RUBBER

Pierre Yves Le Gac[a,c], Peter Davies[a], Mat Celina[b], Bruno Fayolle[c]

[a] *IFREMER (French Ocean Research Institute), Centre de Brest, Materials and Structures Group, BP 70, F-29280 Plouzané, France*

[b]*Sandia National Laboratory, Albuquerque, NM 87185-1411, USA*
[c]*PIMM, Arts et Metiers ParisTech, CNRS UMR 8006, 151 boulevard de l'Hôpital, 75013 Paris, France*
(pierre.yves.le.gac@ifremer.fr)

The aging of polymers is commonly studied either from a chemical point of view[1,2] , by focusing on chemical reactions involved in degradation mechanisms, or from a mechanical point of view by characterizing the change in properties, such as tensile elongation at break[3]. However, there have been few successful studies[4] offering a direct link between the development of chemical changes in the material and the loss of mechanical properties over time.

In this study we focus on the thermal oxidative aging of an unfilled and unstabilized polychloroprene rubber. The ageing chemistry has been characterized using oxygen absorption and FTIR at different temperatures. At the same time, the change of the modulus during oxidation has been measured using in-situ DMA analysis on 100 micron thick films, in order to avoid any Diffusion Limited Oxidation (Figure 1).

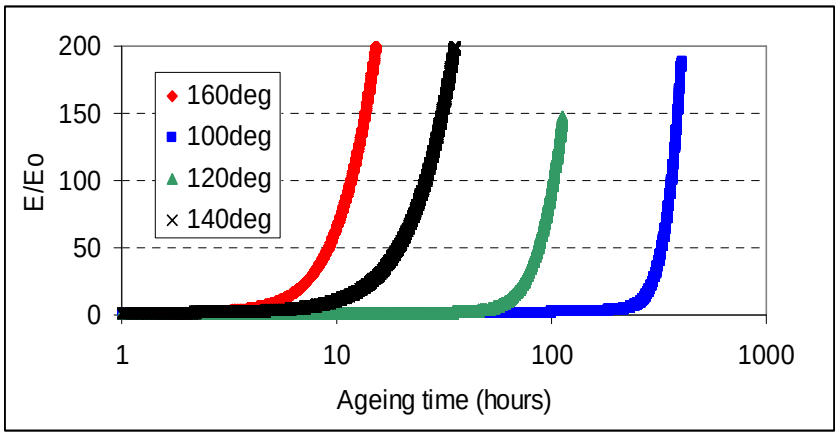

Figure 1 Evolution of the modulus on 100mic thick films as function of ageing time and temperature.

The effect of oxygen diffusion has been assessed by modulus profiling using instrumented indentation on 5mm thick samples during oxidation at 120°C (Figure 2).

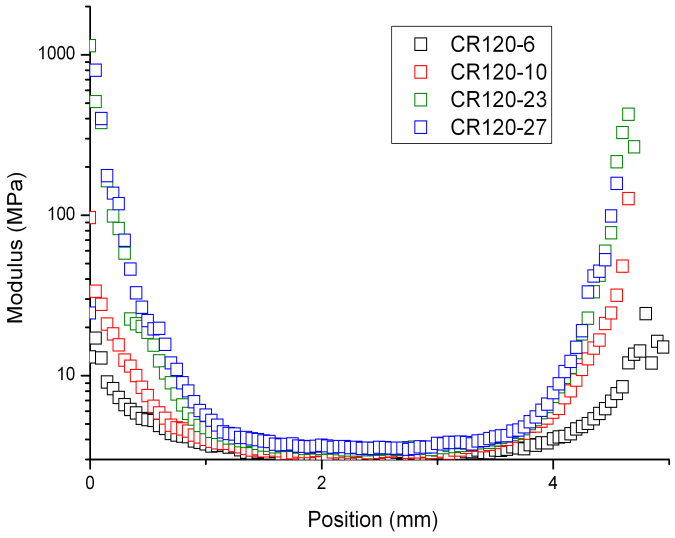

Figure 2 Modulus profile of the unfilled neoprene rubber aged at 120°C for different ageing duration in days.

Using these data, possible relationships between chemical and mechanical property changes during the oxidation of the CR are proposed and discussed.

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3. Ha-Anh T., Vu-Khanh T, Polym. Testing 24:775-780, 2005.

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