



(3) Macromolecular:

191 - Spin-spin relaxation time as a novel parameter for the quantitative evaluation of the degradation of rubber seals

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Abstract Body: We investigated the applicability of ¹H spin-spin relaxation time, T_2 , as a parameter for the quantitative evaluation of the degradation process of sealability of rubber seals. The degradation of the sealability of rubber seals with aging is usually quantitatively evaluated by the compression set (CS), which is known to correlate with sealability. Two kinds of acrylonitrile butadiene rubber (NBR) samples were exposed to air and nitrogen atmospheres at high temperatures of 60, 80 and 100°C for up to 33,000 h. The samples have different compounds and shapes: plate and O-ring. We measured T_2 , CS, acetone soluble fraction and swelling ratio of the exposed samples. T_2 measurements were performed at a ¹H frequency of 25 MHz and 20°C. The decay of magnetization was expressed with two exponential functions which respectively represent short and long components of T_2 . The correlations between T_2 and cross-link density, plasticizer concentration, and CS for the exposed samples were discussed. The short spin-spin relaxation time, T_2^S , was shortened with aging and correlated well with the cross-link density, plasticizer concentration and CS regardless of the atmosphere. These results apparently indicated that the shortening of T_2^S with aging represents the increase in molecular interactions and the decrease in sealability under thermal degradation. Therefore, T_2^S becomes a useful parameter for the quantitative evaluation of the degradation of sealability.

