



(3) Macromolecular:

193 - Inverse Laplace transform and principal component analysis of T_2 decays of polyisoprene rubbers filled with carbon black

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Abstract Body: The ^1H T_2 relaxation decays of the un-cross-linked and the cross-linked *cis*-1,4-polyisoprene rubbers (PI) were investigated as a function of different quantities and kinds of carbon black (CB). First, we considered the ability of the CONTIN program¹⁾ for the inverse Laplace transform (ILT) of the T_2 decays obtained from the PI/CB materials. When the ILT applied to a whole T_2 decay, it produced a monotonous T_2 distribution and the reproduced T_2 decay from the distribution was not in agreement with the observed one. This is because the observed T_2 decay consists of some Weibullian functions. We divided a T_2 decay into three or four sections and applied the ILT to the three or four divided T_2 decays. The respective obtained T_2 distributions showed the well reproducibility of the observed T_2 decay at the respective sections. We compared the estimated T_2 distribution with mechanical properties, filler gel quantity, and cross-link density. The obtained T_2 distribution had a relation to the cross-link density and a well correlation with the CB concentration and the CB classes. We also tried principal component analysis to the obtained T_2 distribution for visualizing the statistical difference of CB classes and to be clear the difference between the bound rubber and the filler gel.

1) Provencher, S. W. (1982) *Comput. Phys. Commun.*, **27**, 213–227 & 229–242.

