PHASE BEHAVIOUR OF CARBOXYLATED NITRILE RUBBER

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ABSTRACT

The overall mechanical performance of ionic elastomers, like carboxylated nitrile rubber (XNBR) is largely governed by the ionic clusters, formed during the crosslinking of the elastomers with zinc oxide. These ionic aggregates promote a microphase separation and show additional high temperature relaxation behavior in dynamic mechanical analysis. In this paper, the nature of these ionic aggregates is explored for the first time. It is presented that some zinc containing compounds, as zinc aluminium layered double hydroxide and zinc chloride, do not exhibit any extra high temperature dynamic mechanical relaxation process, although an ionic crosslinking reaction with XNBR is also be found for this curatives. A quantitative estimation of ionic crosslinking by means of Fourier transform infrared spectroscopy and dynamic mechanical analysis revealed that this high temperature relaxation behavior is not originated from ionic crosslinking, but associated with the formation of additional zinc enriched polymer phase by carboxylic groups with zinc oxide. Infrared spectroscopic investigation indicates further that a tetrahedral co-ordinated complex facilitates the formation of a zinc-carboxylic polymeric network. A clear microphase separation of the ionic polymer could be directly visualized by transmission electron microscopy of the sample which was allowed to swell in organic solvent.

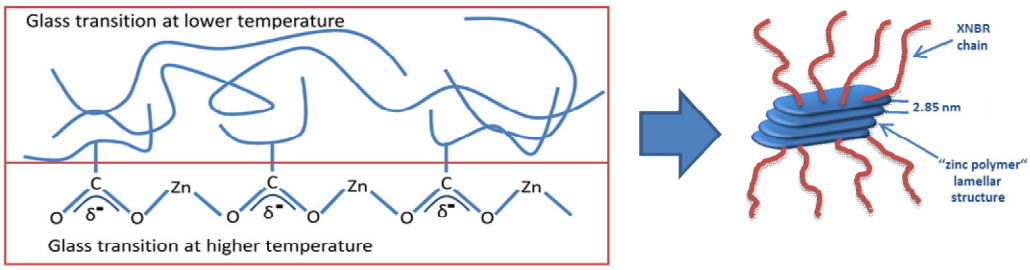

Fig. 1: Carboxylated nitrile rubber is reacted with zinc oxide, an additional polymeric network is formed by a zinc carboxylated co-ordinated complex, showing two different glass transition processes.