

# INFLUENCE OF THE FINE STRUCTURE OF GLASS FORMING MATERIALS ON THE OVERLAPPING OF THE ALPHA AND SECONDARY RELAXATIONS

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The spectra of high molecular weight super-cooled liquids, particularly amorphous polymers, present at short times a relatively weak peak associated with local motions followed in increasing order of time for a prominent peak arising from micro-Brownian segmental cooperative motions, named  $\beta$  and  $\alpha$  absorptions. Although intra-molecular motions, usually associated to lateral chains, were held responsible for  $\beta$  relaxations, Johari and Goldstein (JG) showed that rigid molecules where intra-molecular barriers are unlikely, also show  $\beta$  relaxations. In this way, a JG  $\beta$  process governed by an intermolecular barrier, can be understood as a precursor of the  $\alpha$  relaxation. However, the presence of a  $\beta$  JG secondary relaxation, does not precludes the possible existence of a cascade of further relaxations labelled  $\gamma, \delta, \dots$ , etc in order of decreasing temperatures. For this reason, although intermolecular interactions surely contribute to the response of the condensed matter to perturbation fields in the  $\beta$  zone, intra-molecular interactions presumably play a leading role in the development of secondary absorptions and more specifically in those taking place at cryogenic temperatures.

During the cooling process, super-cooled liquids may reach a temperature at which the single dielectric absorption observed in the moderate super-cooled regime splits into a slow  $\alpha$  and a fast  $\beta$  relaxations. On the other hand, a long time ago, Williams discovered the merging of the  $\beta$  and  $\alpha$  processes for acrylic polymers to form the combined  $\alpha\beta$  process after applying pressure. Although several scenarios have been theoretically proposed to give account of such splitting, further experimental work showed that the merging of the  $\beta$  and  $\alpha$  relaxations depends critically on the chemical structure of the materials. The aim of the present lecture is to analyze recent experimental results on acrylic polymers containing phenyl rings in the alcohol residue, to show how minor changes in their chemical structures may affect the before mentioned splitting behaviour. As a collateral result, the effect of these changes on the fine structure of the relaxation spectra will be discussed.