ABSTRACT

The present work examines the influence of the chemical structure of polymers on thermal, mechanical and dielectric behavior. The experimental techniques used for the purpose are differential scanning calorimetry, dynamo-mechanical analysis and dielectric spectroscopy. Additionally, in order to confirm the results obtained using the above methods, other techniques such as ray diffraction have also been employed.

Chapters 1 and 2 contain the introduction and the objectives, respectively. Chapter 3 briefly describes the experimental techniques used.

Chapter 4 contains the findings of the comparative analysis of the response to electrical noise fields for three poly(benzyl methacrylates) with different structures. The analysis was carried out under a wide range of frequencies and temperatures on three poly(benzyl methacrylates) containing two dimethoxy groups in positions 2,5-, 2,3- and 3,4-. The results show that the position of the dimethoxy groups on the aromatic ring has a significant effect on the molecular dynamics of poly(benzyl methacrylate). The spectra obtained were of high complexity and therefore, in order to perform a better analysis, numerical methods for time-frequency transformation including the use of parametric regularization techniques were used. We studied the effect of this structural change on the secondary relaxation processes and relaxation process α, relating to the glass transition. We also analyzed the effect of the dimethoxy group position on the formation of nanodomains, in which the side chains are predominant, and on the conduction processes of the materials tested.

In Chapter 5, the conductivity of rubbery liquids was studied by analyzing poly(2,3-dimethoxybenzyl methacrylate), which exhibits its own particular behavior. The chapter

analyzes the principle of time-temperature superposition, employing different interrelated variables.

Chapter 6 focuses on how the presence of crosslinking affects the molecular mobility of polymethacrylates containing aliphatic alcohol ether residues. In this case, the effect of crosslinking on the secondary and primary relaxation processes was analyzed. The creation of nanodomains in the side chains as a result of the presence of crosslinking was also studied.