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LINEAR VICOELASTIC RHEOLOGY AS A TOOL FOR THE INVESTIGATION OF THE CHEMICAL ARCHITECTURE OF SYNDIOTACTIC POLYPROPYLENE

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Crystalline elastomers are olefin polymers or co-polymers, where the typical mechanical properties of crystalline materials (high rigidity and high stress-to-break) are associated with those of an elastomer (high deformability, high ductility). The above properties can be modulated by suitably changing the degree of order of the monomer distribution along the polymer chain. This has been made possible in recent years by the development of metallocene and post-metallocene homogeneous catalysts. In this work we studied the rheology of a particular class of crystalline elastomers, namely, a series of syndiotactic polypropylenes (sPP) of varying degree of tacticity. The linear viscoelastic properties of the different polymer samples were measured in both the melt state and below the melting temperature. The melt state experiments allowed the determination of the sPP plateau modulus and, as a consequence, of the molecular weight between entanglements. The experimental results show a strong, well defined correlation between the molecular weight between entanglements and the degree of tacticity of sPP. When performed below the melting temperature of each sample, linear viscoelastic measurements allowed for the determination of the early stages crystallization kinetics, which were also found to strongly depend on the architectural details of the polymer chain.