A COMPARATIVE STUDY OF THE DYNAMIC AND KINEMATIC VISCOSITY OF COMPOSITE MATERIALS BASED ON *o-, m-, p-* CARBOXYPHENYLMALEIMIDE/ABS

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The modification of engineering thermoplastics using functional maleimide derivatives has attracted increasing attention due to the possibility of tailoring mechanical, thermal, and rheological properties. In this study, a comparative investigation of the dynamic and kinematic viscosity of composite materials based on *ortho-, meta-,* and *para*-carboxyphenylmaleimide (*o-, m-, p*-CPhMI) incorporated into acrylonitrile–butadiene–styrene (ABS) was carried out. The positional isomerism of the carboxyl group within the phenyl ring plays a crucial role in intermolecular interactions, compatibility, and chain mobility within polymer blends.

Composite samples containing different ratios of CPhMI isomers in the ABS matrix were prepared by melt blending under controlled processing conditions. The rheological behavior of the obtained materials was evaluated using rotational viscometry to determine dynamic viscosity as a function of shear rate and temperature. Kinematic viscosity values were calculated based on measured density and dynamic viscosity data.

The results demonstrated that the incorporation of CPhMI significantly influences the flow behavior of ABS-based composites. All systems exhibited non-Newtonian pseudoplastic behavior, characterized by a decrease in dynamic viscosity with increasing shear rate. However, noticeable differences were observed depending on the positional isomer used. Composites containing *o*-CPhMI showed higher dynamic viscosity values compared to the *m*- and *p*-isomers, indicating stronger intermolecular interactions and improved compatibility with the ABS matrix.

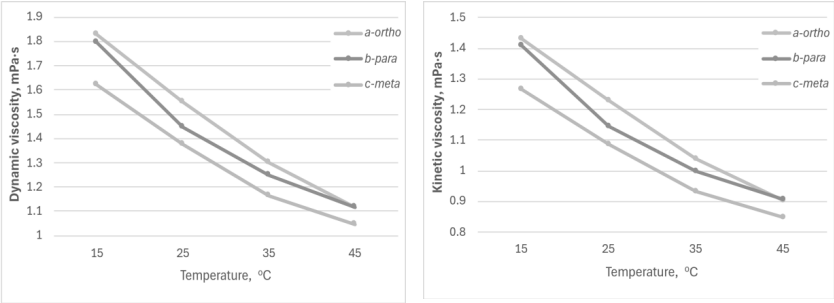

Fig. 1. Dynamic (**a**) and kinematic (**b**) viscosity of the composition *o*-, *m*- and *p*-carboxyphenylmaleimides/ABS at different temperatures

As the temperature increases, all the samples studied exhibit a consistent decrease in dynamic viscosity, which is associated with increased macromolecular mobility and the weakening of intermolecular interactions in the polymer matrix. The composition of *p*-CPhMI/ABS occupies an intermediate position in terms of viscosity, while *o*-CPhMI/ABS exhibits the highest values, which indicates, in this case, a denser packing of macromolecules and the presence of additional intermolecular bonds. A similar trend can be observed in the graphs showing the dependence of kinematic viscosity on temperature (Fig. 1): when heated,

the viscosity of all samples of the composition decreases, but the relative ratio between the isomers added to the composition remains unchanged. The most fluid samples are those containing the *m*-isomer, which has the lowest steric hindrance and the weakest intramolecular interactions. Samples obtained with the *p*-isomer demonstrate an average viscosity value among the compositions obtained, which may be due to a more symmetrical structure and a moderate degree of interaction between the aromatic and imide fragments. While compositions obtained with the *o*-isomer are characterized by the highest viscosity, which is explained by the possible formation of intramolecular hydrogen bonds between the carboxyl and imide groups, as well as the restriction of chain mobility due to spatial factors.

Thus, the data obtained indicate that the rheological behavior of the composites under study directly depends on the position of the substituents in the phenyl ring of the carboxyphenylmaleimide fragment. The isomeric structure determines the degree of conjugation and intermolecular interactions during the formation of the composition and, as a result, the viscosity characteristics of the resulting composite materials.

The study highlights the critical role of molecular structure in determining the rheological performance of functionalized ABS composites. Understanding the relationship between isomeric structure and viscosity provides a scientific basis for optimizing processing parameters and designing advanced polymer materials with tailored properties for engineering applications.