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ROLE OF THE RHEOLOGICAL AND VISCOELASTIC PROPERTIES ON THE DESIGN AND PREDICTED PERFORMANCE OF HOT MELTS AND PSAs

Hot melt adhesives (HMAs) are 100 % solids, they are applied in the molten state at high temperature and their performance is reached upon cooling down. Therefore, the application processes of HMAs are tightly related to their rheological and viscoelastic properties. On the other hand, the adhesion and tack properties of HMAs and pressure sensitive adhesives (PSAs) are tightly related to the compatibility between their components, i.e., the base polymer, the tackifier and/or the wax, as well as to their relative percentages in the formulations. Several studies related to the variation of tack, adhesion, cohesion and thermal stability of PSAs and, more particularly HMAs, with different compositions have been considered in the existing literature, but, in general, the viscoelastic and rheological properties are not so widely analyzed nor related to their performance. The optimization of the formulations of HMAs is usually carried out by experimental testing which is time-consuming and always based on the experience of the formulator. A different focus is the design of HMA formulations for predicting their key properties, the rheological testing is a potentially interesting tool.

The main objective of this presentation is to review our findings related to the rheological characterization of HMAs and PSAs which we have found useful for the design of their formulations and for predicting their performance. Furthermore, the main principles and background of the experimental measurements of the rheological/viscoelastic properties of HMAs and PSAs by plate-plate rheology and dynamic mechanical thermal analysis (DMA) will be analyzed. Finally, some relationships between the rheological/viscoelastic parameters and the compatibility, the application conditions (temperature, viscosity, open time), and tack/adhesion of HMAs and PSAs will be supplemented with different examples corresponding to polyolefin-based HMAs, and polyolefin and polyurethane-based PSAs.

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