Separated Determination Of Carbon Black In Chloroprene Rubber By Simulation Of Heating Rate Conversion

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ABSTRACT

TG is widely used to determine the amount of carbon black in polymer compounds, including in ISO testing. However, some carbonization occurs when the rubber portion thermally decomposes, which produces carbon residue. This carbon residue mixes with the added carbon black and is inadvertently measured. Low heating rate measurement and Controlled-Rate Thermal Analysis (CRTA) aim to improve resolution by utilizing the different oxidative decomposition temperatures of carbon residue and added carbon black. However, it has been noted that measurement accuracy drops if the starting temperature of oxidative decomposition for both the carbon residue and carbon black are similar. Accuracy also drops if the sample contains a lot of carbon residue.

To solve these problems, a simulation of heating rate conversion has been proposed. In this method, the activation energy ΔE is calculated for the multiple decomposition reactions in the TG measurement results. The activation energy is then used to convert data to different heating rates based on the time-temperature reduction law.

This presentation reports on the application of this simulation method to chloroprene rubber with comparatively high amounts of carbon residue. The results show that this method more precisely separated the carbon residue from the added carbon black and improved the accuracy of the measurement of the added carbon black.