Study the effect of chromium complex on the graphitization of phenolic resins for developing thermally stable nano carbon fillers

Hamed A. Al-Falahi

Abstract.

The research aims to study the effect of Cr(C5H7O2)3 as a promoter to accelerate the graphitization of phenolic resins for developing thermally stable nanocarbon fillers to prepare advanced insulators for petrochemical industries. Two types of matrix precursors were used in the present study; the non-modified and modified phenolic resins. Modified resin is prepared through a chemical reaction of resin with an inorganic chromium complex. Graphitization has been successfully achieved in a vacuum at a temperature not exceeding 1400°C. The effects of Cr(C5H7O2)3 on the graphitization degree of nanoparticles carbon were studied by XRD, FTIR, TG, TGA, and DTG. The infra-red results showed that the Cr(C5H7O2)3 complex exhibited an intense band at 3400 cm–1 related to (OH) stretching vibration, and the hydrogen of the hydroxyl replaced by metal ions at (287.4-354 cm–1), related to (M–O). On the other hand, the Cr (C5H7O2)3 form adducts with polymers containing functional groups such as phenols. X-ray analysis showed the Cr (C5H7O2)3 complex promoted the formation of more perfect crystallites, which related to graphitic and turbostratic structures (T&G- components). Thus, the catalyst's action is to accelerate the graphitization process and reduce its degree to 1400°C compared to that needed by amorphous carbon in the conventional process of about 2800°C.