

Nuttawat Ngamwongnoi 2011: Modification of Natural Rubber by Anacardic-formaldehyde Resin. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Attasak Jaree, Ph.D. 102 pages.

The first part of this research focused on the synthesis of Anacardic (AnAc)-formaldehyde based resole resin from cashew nut shell via condensation polymerization. Effects of the different molar ratios of AnAc to formaldehyde, reaction temperature, reaction time, and type of catalyst on the polymer properties were studied. The characterization of AnAc-formaldehyde based resole resin was done by FTIR and GPC analyses. DSC technique was used for investigate thermal properties of AnAc-formaldehyde resin. It was found that T_g and M_w (the average molecular weight of AnAc-formaldehyde resin) increased with increasing formaldehyde content, reaction time, and reaction temperature. The maximum of T_g and M_w of AnAc-formaldehyde resin at 1.0:2.0 molar ratios with 90°C for 10 hours in presence of NH_3 or KOH catalysts were 146.35°C, 3157 g/mol and 135.56°C, 3567 g/mol, respectively. The synthesized resin was used to enhance mechanical properties and thermal stability of rubber compounds.

The vulcanizing time of Natural Rubber (NR)/AnAc-formaldehyde resin blend decreased with increasing the resin contents in the range of 5-15 phr. The NR/AnAc-formaldehyde resin blend exhibited higher tensile strength and elongation at break compared to that of the unmodified NR and the NR modified with commercial resin, due to the plasticizing effect of the unsaturated side chain and methylol groups of AnAc-formaldehyde resin to form the entangled network structure with NR. Therefore, NR/AnAc-formaldehyde resin blend was more flexible. However, the higher compression set of the NR/ AnAc-formaldehyde resin blend resulted from the chain scission with thermal conditions and the hindrance of the unsaturated sites of aliphatic long chain of AnAc-formaldehyde resin.

Student's signature

Thesis Advisor's signature