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The Synthesis and Characterization of Highly Water-Soluble Silane Coupling Agents for Increasing Silica Filler Content in Styrene-Butadiene Rubber

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Abstract : The synthetic rubber compound, which is widely used as the core material for automobile tire industry, is manufactured by mixing styrene-butadiene rubber (SBR) and organic/inorganic fillers. It is known that the most important factor for the physical properties of rubber compound is the interaction between the filler and the rubber, which affects the rotational, braking and abrasion resistance. Silica filler has hydrophilic groups such as a silanol group on their surface which has a low affinity with hydrophobic rubbers. In order to solve this problem, researches on an efficient silane coupling agent (SCA) has been continuously carried out. In this study, highly water-soluble SCAs which are expected to show higher hydrolysis efficiency were synthesized. The hydrophobization process of the silica with the prepared SCAs was economical and environment-friendly. The SCAs structures were analysed by gas chromatography-mass spectrometry (GC/MS) and nuclear magnetic resonance (1H-NMR) spectroscopy. In addition, their hydrolysis efficiency and condensation side reaction in SBR wet master batch were examined by Fourier transform infrared spectroscopy (FT-IR) and gel permeation chromatography (GPC), respectively.

Keywords : rubber, silane coupling agent, synthesis, water-soluble
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