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Preparation and Properties of Modified Porous Starch/Carbon Black/Natural Rubber Composites

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Abstract

Starch is considered as a cost-effective, abundant, renewable and environmental-friendly filler for rubber reinforcement via proper modification. In the present study, porous starch (PS) was modified by esterification with dodecenyl succinic anhydride (DDSA) for preparation of DDSA-modified porous starch (DDSA-PS). The suitable esterification conditions (e.g., temperature, time and dosage of DDSA) were discussed by single-factor experiments as 40 ℃, 8 h, and 8 wt % (based on porous starch dry weight), respectively. Later on, a series of DDSA-PS/carbon black (CB)/natural rubber (NR) composites were prepared from the mixture of carbon black and DDSA-PS/NR compound that was pre-processed by co-coagulation of DDSA-PS and rubber latex. When the total filler dosage is constant as 60 parts per hundred rubber (phr), various properties of DDSA-PS/CB/NR composites were investigated by varying the composition ratio of DDSA-PS/CB. The results showed that when the ratio of DDSA-PS/CB was