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收稿日期:2023-10-30

Effect of Rubber Type and Carbon Black Type on Thermal Conductivity of Vulcanizate

CHEN Xiaojie¹, GUO Heying¹, YUAN Chenchen¹, ZHAO Yali¹, ZHANG Xiubin²

(1. Stone Laboratory Co., Ltd., Qingdao 266045, China; 2. Sailun Group Co., Ltd., Qingdao 266045, China)

Abstract: The thermal conductivities of vulcanizates made from four types of rubber[natural rubber (NR), solution styrene butadiene rubber (SSBR), emulsion styrene butadiene rubber (ESBR) and butadiene rubber (BR)] and nine types of carbon black were studied, and an accurate method for measuring the specific heat capacity of vulcanizate was established to identify the rubber and carbon black types with superior thermal conductivity. The results showed that the modulated differential scanning calorimetry (MDSC) method could accurately reflect the specific heat capacity of vulcanizate and improve testing efficiency and accuracy. The specific heat capacity of vulcanizates with different types of rubber and carbon black increased with the increasing temperature, the thermal diffusivity exhibited a linear negative correlation with temperature, and the thermal conductivity of vulcanizates decreased with increasing temperature. At the same temperature, the thermal diffusivity and thermal conductivity of BR, ESBR, SSBR, and NR vulcanizates decreased in sequence. Carbon black with a high structure and small particle size facilitated the increase of thermal diffusivity of vulcanizate, while carbon black with a moderate particle size had a better effect on improving the thermal conductivity of vulcanizates.

Key words: rubber; carbon black; vulcanizate; thermal conductivity; MDSC method; specific heat capacity

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(本刊编辑部)