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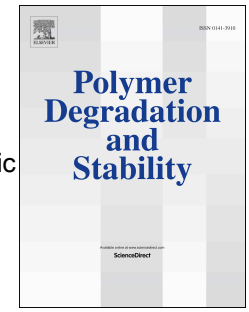

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Mechanical and Ceramifiable Properties of Silicone Rubber Filled with Different Inorganic Fillers

Jinhe Wang*, Chentao Ji, Yuantao Yan, Di Zhao, Liyi Shi

Research Center of Nano Science and Technology, Shanghai University, Shanghai 200444, P. R. China

Abstract

Fire-resistant materials that provide protection of lives and properties are highly desirable in many applications such as aerospace, electronics, construction building and power transmission. However, most of them are inorganic materials with inconvenient processing or high cost. Conventional polymers are generally consumed completely under fire condition so that they can't provide the char sufficient mechanical strength to resist falling away from the protected substrate. Ceramifiable polymers have fire-resistant property and good processability at the same time. This work studied the mechanical strength of different silicone rubber composites (SR-composites) before and after pyrolysis. Properties such as tensile strength, elongation at break, thermal stability, volume variation and residue strength were discussed. SR-composites with five different inorganic fillers exhibited improved mechanical properties after treatment of fillers than the SR-composites filled directly. The layered structure, high aspect ratio, small particle size and good surface organic modification are the reasons of tension strength and elongation at break increase. The thermal stability of the SR-composites decreased due to the incorporation of fillers. The effect of frits on properties of the residues was investigated. Volume variation, compression strength and scanning electron microscopy showed that the frits play a main role of physical bonding with other fillers and keep the shape of residual integrity in the pyrolysis process at 650℃ and assist the formation of ceramic at 950℃, which lead to volume shrinkage and significant compression strength increase of the residues.

Keywords: silicone rubber; fire-resistant; ceramifiable polymer; inorganic filler treatment