Preparation and Properties of Attapulgite / Natural Rubber Micro - Nano Composites

Journal	Advanced Materials Research (Volumes 148 - 149)
Volume	Manufacturing Processes and Systems
Edited by	Xianghua Liu, Zhengyi Jiang and Jingtao Han
Pages	1668-1673
DOI	10.4028/www.scientific.net/AMR.148-149.1668
Citation	Mei Yang et al., 2010, Advanced Materials Research, 148-149, 1668
Online since	October, 2010
Authors	Mei Yang, Sheng Hu, Shang Yue Shen, Tie Li, Miao Wan
Keywords	Attapulgite, Clay Aqueous Suspension, Co-Coagulating Rubber Latex, Mechanical Properties, Micro-Nano Composites, Natural Rubber (NR), Vulcanization Properties
Abstract	The attapulgite / natural rubber (NR) micro-nano composites were prepared by co-coagulating rubber latex and clay aqueous suspension. The vulcanization behavior, mechanical properties and microcosmic structure of the composites were investigated. The field emission scanning electron microscope (FESEM) micrographs of the composites showed that the attapulgite stick particles inserted into the rubber. The interaction between the attapulgite and natural rubber could be improved by using the attapulgite pre-modified with cetyltrimethylammonium bromide (CTAB). The properties of the composites filled with CTAB-modified attapulgite are better than that of the composites filled with carbon black N330. The best properties, which the tensile strength, the 300% tensile modulus and the tear strength increase by 46.9%, 269.7%, 102.0%, respectively, compared with the composites with the unmodified attapulgite, can be obtained, when 20 phr CTAB-modified attapulgite was added.
Full Paper	

First page example

Advanced Materials Research Vols. 148-149 (2011) pp 1668-1673
Online available since 2010/Oct/27 at www.scientific.net

doi:10.4028/www.scientific.net/AMR.148-149.1668

Preparation and Properties of Attapulgite / Natural Rubber Micro - Nano Composites

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Keywords: attapulgite, natural rubber, micro-nano composites, co-coagulating rubber latex and clay aqueous suspension, vulcanization properties, mechanical properties.

Abstract. The attapulgite / natural rubber (NR) micro-nano composites were prepared by co-coagulating rubber latex and clay aqueous suspension. The vulcanization behavior, mechanical properties and microcosmic structure of the composites were investigated. The field emission scanning electron microscope (FESEM) micrographs of the composites showed that the attapulgite stick particles inserted into the rubber. The interaction between the attapulgite and natural rubber could be improved by using the attapulgite pre-modified with cetyltrimethylammonium bromide (CTAB). The properties of the composites filled with CTAB-modified attapulgite are better than that of the composites filled with carbon black N330. The best properties, which the tensile strength, the 300% tensile modulus and the tear strength increase by 46.9%, 269.7%, 102.0%, respectively, compared with the composites with the unmodified attapulgite, can be obtained, when 20 phr CTAB-modified attapulgite was added.

Introduction

The clay / polymer nanocomposites have been paid great attention in recent years because of their good properties [1-9]. The clay / polymer nanocomposites prepared by using the clays, such as montmorillonite [10,11], kaolin [12,13], rectorite [14], as filler have been extensively studied. Attapulgite or palygorskite is a kind of natural hydrous clay mineral with fibrous rod-like microstructure. It is the ideal mineral filler which can be used in preparation of the attapulgite / NR micro-nano composites due to its excellent physical and chemistry properties and its special structure and shape. It is difficult to disperse the nanoscale attapulgite particles into the rubber by the traditional processing technique because of the agglomeration of the particles. The composites with the agglomerated particles would not perfectly exhibit the special properties of the micro-nano composites. Therefore, a new processing technique would be used for preparation of the attapulgite/rubber micro-nano composites [15].

In this work, the attapulgite / NR micro-nano composites were prepared by co-coagulating rubber latex and clay aqueous suspension. The microstructure and properties of the composites were investigated.