

Preparation and characterization of environment friendly used rubber powder modified pulp sediments composites

Weili Wu · Jing Zhang

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Abstract In recent years, with growing contradiction between energy supply and demand, the more and more high demand of the environmental protection is needed. The work represented an environment friendly method for recycling of waste rubber and pulp sediment that a new composite material was prepared using pulp sediment as the matrix, used rubber powder as the toughening agent, and sawdust as the reinforcement. The effects of used rubber powder content on the mechanical properties of the pulp sediment and sawdust/pulp sediment were studied by measuring Shore A hardness, tensile stress, and elongation-at-break. The morphology of used rubber powder/pulp sediment composites was analyzed by scanning electronic microscopy and transmission electron microscopy. The curing conditions were also discussed. The results showed when the used rubber powder/pulp sediment mass ratio was 8/100, the used rubber powder/pulp sediment sample showed smooth surface, high hardness, compact structure, uniform arrangement, and good compatibility. When the pulp sediment used as the matrix, sawdust as the reinforcement, and used rubber powder as the toughening agent, the proper recipe of the composites was 100 phr pulp sediment, 30 phr sawdust, and 10 phr used rubber powder. The mechanical properties of the used rubber powder/pulp sediment were greater than those of pure pulp sediment and used rubber powder/sawdust/pulp sediment. The best curing conditions for the used rubber powder/pulp sediment composites were at 150 °C under 5 MPa for 15 min. The study on used rubber powder modified pulp sediment, exploits a new way to recycle used rubber powder and pulp

sediment, not only benefit environment purification, but also reduce cost of sheet materials, and develops a new way for the economy and environment protection.

Keywords Pulp sediments · Used rubber powder · Preparation · Characterization

Introduction

In recent years, with growing contradiction between energy supply and demand, the more and more demand of the environmental protection is needed [1]. The industrial and life waste treatments have attracted increasingly people's attention [2]. A variety of industrial production wastes contain different pollutants [3]. The industrial wastes mishandling not only cause serious environment pollution [4] but also lead to waste of resources [5]. In order to get out of the natural resource scarcity [6], the energy crisis problems and waste material pollution to the environment [7], the economic, effective recycling of the industrial wastes have always been the focus of attention in the whole society [8]. The worldwide experts have studied industrial production toward renewable resources [9] and secondary energy utilization [10].

Modern paper industry is one of the major industries. Paper and cardboard production has been used to mark a national modernization and civilization [11]. In China, the paper industry has been an important part of the national economy. According to the material forecast, paper and cardboard demand will reach 75–80 million ton by 2015 [12]. Owing to the process technology of the Chinese papermaking industry has been relatively backward for years, the products are in low level, and environmental pollution is serious. In addition, because the papermaking

W. Wu (✉) · J. Zhang
College of Materials Science and Engineering, Qiqihar
University, Qiqihar 161006, People's Republic of China
e-mail: wuweili2001@163.com