RECYCLING TEXTILE RESIDUES INTO CEMENT COMPOSITES

Hugo Monteiro¹, Fernando Caldeira¹*, Jorge Pinto², Humberto Varum³

¹CIAGEB – Research Center on Global Changes, Energy, Environment and Bioengineering, GAEA – Group of Environment and Applied Ecology, Fernando Pessoa University, Praça 9 de abril, 4249-004 Porto, Portugal
²Trás-os-Montes and Alto Douro University, Vila Real, Portugal, and Associate Laboratory I3N, Aveiro, Quinta dos Prados, 5000-801 Vila Real, Portugal
³Faculty of Engineering of the University of Porto, Rua Doutor Roberto Frias s/n, 4200-465 Porto, Portugal

Abstract

Changing wastes into raw materials is one of the most favored options for waste management, as it diverts wastes from landfill and saves resources. Fibers, either vegetable (cellulosic) or synthetic, may be added to cement pastes in order improve the properties of concrete or mortar by reinforcement. At the same time, if the source of fibers is wastes, then such processes make ways for recycling. In the work described here we studied the compatibility of residues from the nonwoven textile industry with Portland cement, with the aim of manufacturing reinforced fiber-cement composites. The methodology was based on the monitoring of the temperature of cement setting, and when fiber or other materials were added to cement pastes. Results showed that the textile waste from needling machines investigated here is not compatible with cement. The reason is ascribed to a higher cotton content (65%), which enables cation exchange to occur in cement suspensions, and that disturbs cement setting reactions. On the other hand, however, synthetic fibers do not seem to hinder cement setting.

Key words: cement, compatibility, recycling, textile, waste

Received: June, 2013; Revised final: October 2014; Accepted: October, 2014; Published in final edited form: August, 2018

* Author to whom correspondence should be addressed: e-mail: fcaldeiraj@gmail.com; Phone: +351919092704; Fax: +351225508269