Alumina addition influence on the polymer composites properties

Karina Guerra Tonet, MSc; Jane Proszek Gorninski, Ph. D.

Graduate Program in Civil Engineering – School of Civil Engineering– Universidade do Vale do Rio dos Sinos (UNISINOS), Av. Unisinos, 950, ZIP 93022-000, São Leopoldo, RS, Brazil

e- mail: proszek@unisinos.br

ABSTRACT

The civil construction sector has found use for a range of industrial waste products as substitutes that are as effective as standard construction materials but which have the bonus of providing an ecologically sound alternative for materials that would otherwise become an environmental concern. The use of waste materials in cement and polymer composites is a prime example of this practice. These composites display excellent mechanical properties but must be adapted to the combustibility properties. The study aimed to produce polymer concrete composites using waste alumina from the metallurgic industrial processing. The composites have an orthophtalic polyester resin as a binder and as aggregates river sand and fly ash. Two compositions were generated with two kinds of flame retardant waste, polishing alumina and a commercial alumina used in four different percentage 15, 30, 45 and 60% in mass in relation to the resin. The samples were subjected to testing of compressive and flexural strength, temperature changes of 125, 225 and 325°C and porosity by mercury addition. Results had statistical treatment in order to evaluate the variable significance in relation to the studied properties. This study composites displayed values between 65,4 and 80,2 MPa for compressive strength and about 30 MPa for flexural strength. The statistical analysis showed that the factors temperature changes, percentage of addition and the interaction among these factors posed great influence on the studied compositions in relation to the heating strength testing. In general terms, it can be said that the flame retardant waste, polishing alumina, is an efficient alternative to substitute the trihydrated commercial alumina in the polymer concrete composites with the other components proposed in this study.

Key words: polishing alumina, recycling, polymer concrete, fly ash, combustibility