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# OPTIMIZATION PROCESS OF POLYESTER POLYMER MORTARS MODIFIED WITH RECYCLED GFRP WASTE AGGREGATES – APPLICATION OF FACTORIAL EXPERIMENT DESIGN-

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**Summary.** *Glass fibre-reinforced plastics (GFRP), nowadays commonly used in the construction, transportation and automobile sectors, have been considered inherently difficult to recycle due to both: cross-linked nature of thermoset resins, which cannot be remolded, and complex composition of the composite itself, which includes glass fibres, matrix and different types of inorganic fillers. Presently, most of the GFRP waste is landfilled leading to negative environmental impacts and supplementary added costs. With an increasing awareness of environmental matters and the subsequent desire to save resources, recycling would convert an expensive waste disposal into a profitable reusable material.*

*There are several methods to recycle GFR thermostable materials: (a) incineration, with partial energy recovery due to the heat generated during organic part combustion; (b) thermal and/or chemical recycling, such as solvolysis, pyrolisis and similar thermal decomposition processes, with glass fibre recovering; and (c) mechanical recycling or size reduction, in which the material is subjected to a milling process in order to obtain a specific grain size that makes the material suitable as reinforcement in new formulations. This last method has important advantages over the previous ones: there is no atmospheric pollution by gas emission, a much simpler equipment is required as compared with ovens necessary for* *thermal recycling processes, and does not require the use of chemical solvents with subsequent environmental impacts.*

*In this study the effect of incorporation of recycled GFRP waste materials, obtained by means of milling processes, on mechanical behavior of polyester polymer mortars was assessed. For this purpose, different contents of recycled GFRP waste materials, with distinct size gradings, were incorporated into polyester polymer mortars as sand aggregates and filler replacements. The effect of GFRP waste treatment with silane coupling agent was also assessed.*

*Design of experiments and data treatment were accomplish by means of factorial design and analysis of variance ANOVA. The use of factorial experiment design, instead of the one-factor-at-a-time method is efficient at allowing the evaluation of the effects and possible interactions of the different material factors involved.*

*Experimental results were promising toward the recyclability of GFRP waste materials as polymer mortar aggregates, without significant loss of mechanical properties with regard to non-modified polymer mortars.*