



ASSESSMENT OF PARTICLE REINFORCED COMPOSITES BASED ON FULL FACTORIAL AND SIMPLEX-LATTICE DESIGNS

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Abstract: This work describes the physical and mechanical performance of polymeric particulate composites based on epoxy matrix phase and cement, silica and/or carbon powder inclusions. Two experiments were conducted to evaluate the incorporation of the micro particles in a separately (experiment I) and combined way (experiment II). A full-factorial Design of Experiment (DoE) was performed to identify the effect of the particle mass fraction (3%, 6% and 9%) on the compressive and tensile stiffness/strength and bulk density of the composites. A simplex-lattice design {3, 2}, using central points, was performed to identify the optimal mixture of cement, silica and carbon powder on the compressive stiffness and strength of hybrid composites. The mass fraction was restricted by the optimal concentration (9%) established in the experiment I. Experiment II revealed that the incorporation of 9% of particles led to increased compressive behaviour. Higher properties were achieved for epoxy matrix reinforced with carbon powder inclusions.

Keywords: Particulate, Composites, Epoxy, Cement, Silica, Carbon