EVALUATION OF THE EFFECT OF GRAPHENE IN MORTARS PRODUCED WITH BLAST FURNACE SLAG

Tarcizo Souza, Paloma Soares, Xavier Yves Roger Raby, Rafael da Silva, Valdirene Peressinotto
Gerdau Graphene, 3200 Engenheiro Miguel Gemma Av., Mogi das Cruzes, Brazil.
tarcizo.souza@gerdaugraphene.com

This work focuses on utilising granulated blast furnace slag (GGBFS), a supplementary cementitious material, in synergistic effect with graphene, as an alternative to reduce CO_2 emissions. GGBFS is commonly used in the production of composite cement [1] but has limitations in performance at early ages due to its low reactivity. On the other hand, researchers have been studying the incorporation of graphene to improve performance in cementitious nanocomposites due to its exceptional physical properties, [2-4]. To evaluate performance, mortars were produced using the replacement of pure cement by 20% and 40% of GGBFS along with graphene at ratios of 0.015%, 0.030%, and 0.050% (wt). These were compared to a reference mortar without substitution and graphene.

There were no significant changes in the fresh state. However, graphene effectively improved compressive strength in the hardened state, even at early ages. Additionally, it increased the elastic modulus and durability-related parameters. This creates a new method to boost the use of GGBFS in cementitious composites without sacrificing performance, alongside the potential to help reduce carbon emissions from cement production.

References

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Figures

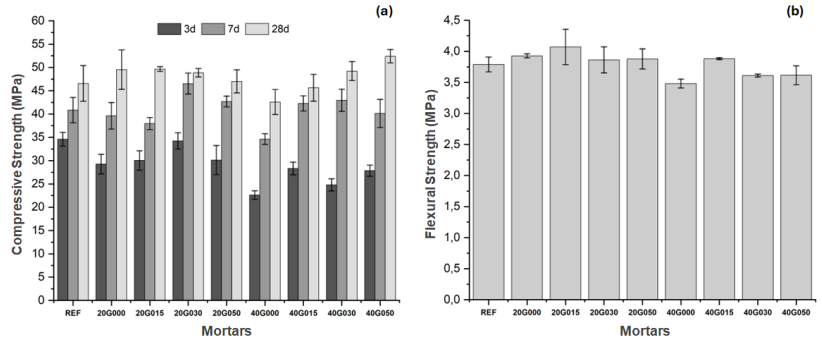

Figure 1: (a) Compressive strength evolution; (b) Flexural strength at 28 days.

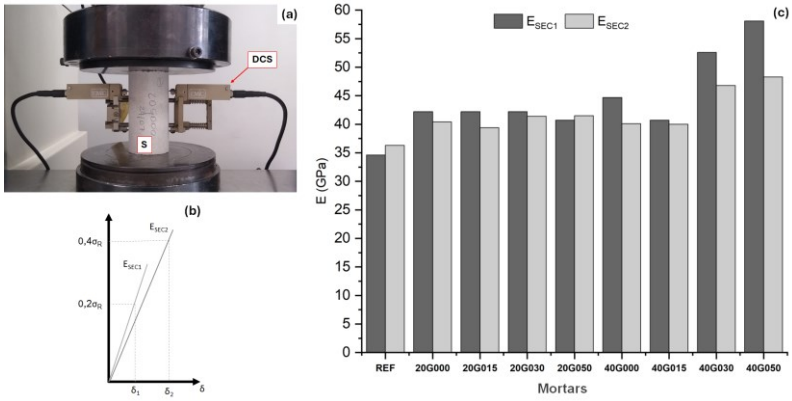

Figure 2: (a) Apparatus to obtain Young´s Modulus (S- sample; DCS – Data collection system); (b) Stress-strain curve; (c) Secant Modulus values.