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Few-layer graphene-based sustainable cement mortar

Building materials have a high impact on the environment during their life cycle [1]. Cement composites, the most widely used class of construction materials worldwide, is struggling in keeping the current pace of growth [2]. More than 4 billion tonnes of cement are produced every year, accounting for around 8 per cent of global CO₂ emissions. Various strategies can be adopted to reduce the impact on the environment, e.g., improving the production techniques, reducing the ratio of cement to clinker, and using innovative technologies [3]. Among the technological resources for improving cement composites sustainability, a solution is the use of nano additives. Nanoparticles (e.g., aluminium dioxide or titania nanoparticles) can increase the durability of cement conglomerates [4]. Graphene stands out among the wide variety of carbon-based nano additives that could revolutionise the cement composites sector. Nevertheless, the large scale production of graphene is still limited, precluding the desired high-performance cement composites commercialisation. [5,6]

A high-pressure homogeniser (HPH) method is proposed to produce multi-layer and few-layers graphene using non-toxic solvents at semi-industrial rates, *i.e.* kg per day [7]. The high production rate of graphene offered by HPHs enables us for testing innovative graphene-based cement mortar (**Fig 1**). The few-layer graphene-based composite produced shown an improvement between the 25 and 29% for both the flexural and compressive strength compared to a standard cement mortar.

References

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Figures

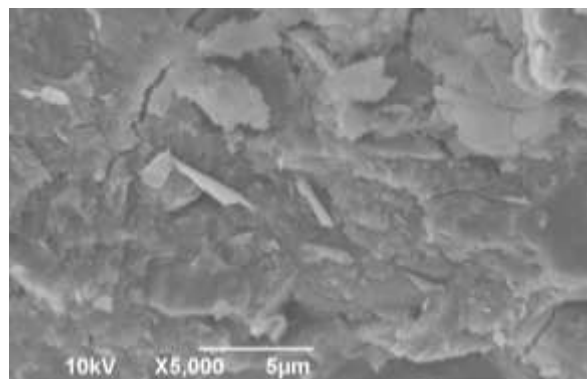


Figure 1: SEM image of the graphene-based cement mortar.