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Graphene/cement composite materials: Flexural strength and microstructure

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Cement, as the most commonly used building materials in civil engineering, plays an important role in building construction. However, because of its brittle characteristic and low strength against tension, it is difficult for them to meet some aspects of the engineering demands. With the development of nanotechnology and nanomaterials, the concept of introducing nanomaterials into composites has attracted more and more researchers' interests to enhance the performance of composite materials. The purpose of this study is to discover the effect of graphene in the cementitious material and describe the interaction between graphene sheets and hydration products in the composite cement. The flexural strength and microstructure of graphene/cement composite materials were investigated in depth. Scanning Electron Microscopy (SEM) was adopted to observe the microstructure of graphene/cement composites. It was found that graphene can increase the flexural strength of cement mortars. The SEM images show that the hydration products such as ettringite and C-S-H gel can be connected with graphene sheets, which forms 3D structure that can bridge the cracks and fill the pores in cement matrix. With the increase of hydration ages, the 3D structure becomes more complicated and the connection between the graphene and hydration products of the cementitious materials becomes stronger. X-Ray Diffraction (XRD) quantitative analysis indicates that the amount of ettringite increases with the increasing of graphene content, suggesting that graphene sheets are helpful to promote the formation of ettringite.

Biography

Na Zhang is currently working as an Associate Professor of China University of Geosciences, Beijing. She has her expertise in utilizing industrial solid wastes to prepare building and construction materials and also introducing nanomaterials into the cementitious materials to enhance the performance of composite materials. So far, she has published 21 SCI papers in the related research field.

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