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Micro indentation mechanical properties of graphene nanoenhanced cement paste assessed by energy-based method

Własności mechaniczne nanokompozytu cementowego z próby wciskania mikro wgłębnika oszacowane w oparciu o metodę energetyczną

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This paper presents an energy-based method to assess the mechanical properties of a graphene hardened cement paste by using nano indentation technique. It is study adopted a cemented paste filled with graphene platelets percentages of 0.05 % and 0.1 % with respect to the weight of the cement. A mix with a water-to-cement ratio of 0.4 was designed. The model of indentation test with Berkovich tip was initiated by the additionally generated fracture energy that is assumed to be evenly distributed during deformation process, and only requires the load-displacement curves that follow power functions. An explicit equation for estimating the plastic energy with the effect of holding load at peak force procedure was accepted, which, together with the principle of energy balance, allows us to assess the fracture energy, energy release rate and fracture toughness of the graphene hardened cement paste. Overall, the presented nanoindentation testing method provides an efficient way to assess the fracture properties in micro scale of cement-based, polymer-based and many other nanocomposites.