Ultra-Fine Fly Ash Geopolymer Mortars: Influence of Carbonaceous Admixture on New Functional Properties

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Multifunctional building materials have a significant potential for a qualitative shift in the design of structures with new functions. Typical challenges in civil engineering such as reliable preheating/heating constructions (electrothermal heating) and monitoring the current material condition (self-sensing ability) can be settled by multifunctional materials with optimized electrical properties. Since the electrical properties of geopolymers are inadequate for such applications, optimization through doping with electrically conductive admixtures is necessary. In the scope of this paper, ultra-fine fly ash geopolymer mortars with different amounts of carbonaceous admixture were designed and characterized in terms of important material properties for civil engineering applications (basic physical, mechanical, and thermal). The characterization was supplemented by the determination of electrical properties and testing the new functions by the self-heating and self-sensing experiments.