Review of PhD thesis

Study on Properties of Geopolymers for Application in Transport Means

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The doctoral thesis is concentrated on the study of alkali activated materials based on fly ash and the possibility of their application as sealants in transport means. The main purpose of this research was to find new materials with good properties and relatively low cost.

As waste materials utilization and greenhouse gas emissions reduction are very important issues, the scientists try to find new alternative materials not only with good engineering properties but also environmentally friendly. Geopolymers are exactly such materials. Basic properties of alkali activated materials, such as their adhesiveness, high temperature resistance, frost resistance, resistance to aggressive environment, heavy metals immobilization make them promising for practical use. That's why the investigations conducted in this doctoral thesis are topical.

In the doctoral thesis author studies the properties of fly ash based geopolymers as high temperature resistant sealants and their application in transport means. The main objective of the doctoral thesis was to verify the possibility of alkali activated materials' application as high temperature sealants for steel adherents bonding and their high temperature resistance. Then it was very important to characterize prepared materials in terms of structure (SEM) and elemental analysis (EDX analysis).

The adhesive properties of fly ash based geopolymers haven't been practically studied yet. Their practical application as adhesives or sealants in transport means haven't been studied at all. In the result of research a new two-part sealant was obtained. Conducted experiments showed that the optimal composition had samples G5A and GK7A. These samples can be applied as high temperature sealants in few applications in transport means. Besides that they would have a competitive price in comparison with the similar materials.

The thesis fulfills conditions of creative research work. Author fully achieved purpose of work that can be a starting point for further research in this area and finding new geopolymers applications in transport means.

In the chapter 4.1 the adhesive properties of alkali activated materials are considered. It is clear from the mentioned literature sources that very important factors are Si/Al and Na/Al ratios. But the optimal ratios vary depending on literature source, besides, the author of the doctoral thesis determined her own, the most suitable ratios during the experiments. Please answer, why are these data so different?

In the chapter 10.1 the author shows, that sand blasting plus phosphating or anodic passivation are the most appropriate ways of steel adherents pretreatment. But the author doesn't explain why these types of steel surface pretreatment procedures are the most suitable. Please explain.

The stated objectives of the doctoral thesis were fulfilled. The doctoral thesis meets the requirements of creative scientific work. The doctoral thesis presents new possibilities of alkali activated materials application as sealants for steel adherents bonding, which haven't been deeply studied yet. The potential application of alkali activated materials as corrosion resistant coatings for steel protection is also very interesting.

Based on above stated, it can be concluded that Mgr. Olena Halas proved the ability to creative scientific work and possesses desirable knowledge. The doctoral thesis by Mgr. Olena Halas fulfills all the conditions for gaining the PhD degree, therefore it is recommended.

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Doc. Ivan Shpak, CSc.