Editorial

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Cementless concrete for sustainable construction

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Green environment is a challenging concern to accomplish in today's world. This could be achieved through a beneficial recycling procedure that aims at reusing solid waste materials. Concrete industry can play a huge role in sustainable development of the society. Production of 1 ton of Portland cement is an energy intensive process and also generates about 1 ton of CO_2,[1,2] which represents about 5-7% of the global green-house gas produced annually. The increase in population needs development plans especially for infrastructure, thus there will be an increasing demand on cement and therefore an expected increase in CO_2 emission which will have negative impact on the environment. Usage of substitution materials as partial or complete replacement of cement is considered an efficient solution. Silica fume, fly ash and slag are used as supplementary cementing materials (SCM) in daily concrete production.[3] This step has made its effect on reducing the CO_2 emission. With the current practice which involves the use of SCM in the range of 20% to 50% replacement of OPC, the CO_2 emission from cement production is reduced by around the half.[3]

The alkali-activated binders have emerged as an alternative[4–6] sometimes referred to as inorganic-polymer concrete or geopolymer concrete. In geopolymer concrete, cement is completely replaced by alkali activated aluminosilicate-rich materials. This new concrete type started to attract several investigators. The geopolymer concrete utilizes any material composed of silica and aluminum which can be alkali-activated to form a CaO-free alumino-silicate binder. During the last decade increased research was directed to the development of this new material due to the wide range of potential applications.[7] The performed investigations utilized different prime (i.e. source or binder) materials such as metakaoline, blast-furnace slag, fly ashes, mixtures of fly ash and metakaoline, mixtures of fly ash and slag.[8]

As seen from these investigations, the prime materials used are mainly solid waste byproducts; therefore the geopolymer technology has the potential to reduce the CO_2 emission by about 80%.[9] Several solid wastes such as ladle slag, ceramic powder and red mud are generated from different industries and only find its way in landfill. This brings a major challenge with respect to its environmental impact. On the other hand, it represents a good opportunity to be utilized in making geopolymer concrete. These solid waste materials were not explored for geopolymer concrete and did not attract the attention of researchers. The utilization of these solid waste materials in the production of geopolymer concrete will have multifold benefits; it will help reduce the carbon dioxide emission by reducing the cement production, help reserve natural resources used to manufacture cement and help protect the environment by recycling solid wastes. The produced geopolymer concrete is expected to play a significant role in producing sustainable construction.

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Conflict of interest

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