Utilization of Recycled Brick Waste in Geopolymers: Investigating Shrinkage Behavior and Heat Evolution

Martin Mildner[1, S, C]

[1]*Department of Materials Engineering and Chemistry, Czech Technical University in Prague, Prague 6 - Dejvice, Czech Republic, Czechia*
martin.mildner@fsv.cvut.cz

Given the current global need to find a greener alternative for cementitious composites, the development of alkali-activated materials (AAMs) is gaining importance worldwide. With an eye on the future, efforts are being made to apply trends in the use of local waste or secondary resources to produce new innovative materials. This approach reflects a shift away from traditional products made from primary raw materials that emphasizes sustainability and reducing environmental impact.

Currently, research on AAMs is mainly concerned with their physical and mechanical properties, but the study of the effect of hydration heat and shrinkage, which is associated with internal deformations during maturation, also plays an important role, especially in the development and optimisation of the production processes of these materials. AAMs are produced by activating the precursors in an alkaline environment, most commonly with hydroxides or silicates. In the hydration process of AAMs, the ratio between precursor and activator is of key importance, as is the combination of different types of precursors and alkaline activators. Related to this is the different development of the hydration heat of the different mixtures, which can significantly affect the mechanical properties of the material. AAMs are more prone to shrinkage than traditional cementitious materials. This study will investigate the development of hydration heat and shrinkage on geopolymer blends made from recycled construction waste, specifically waste bricks.

Studying these aspects in AAM is essential for the successful development and implementation of these materials for various construction applications. Understanding the effect of hydration heat and shrinkage allows designing innovative materials with optimal properties and thus exploiting their full potential not only in terms of environmental sustainability.