

Production of light aggregate for encase in lightweight geopolymer concrete

In Hungary, approximately 200-250 thousand tons per year of glass waste is produced, but only 5-15% of it has been recycled. One method for recycling is use as aggregate in concretes. To recycling in glass production again it needs separation, when the coloured glass is put aside that's why it needs to deposit in landfills. For this problem producing foam pebble would be a good solution. The foam pebble is a material which contains glass in a high volume. We can produce a kind of aggregate with two methods. Firstly, if we grind the glass to a specific sized particle and secondly, depending on its compound if we homogenise it with different amount of gas developing agent we get a porous lightweight material. With this material we can use as lightweight aggregate to a binder (e.g. concrete, resin).

High amount of the world's energy production is based on power stations which use coal. Deposited fly ash can cause serious environmental risk. In Hungary 2-3 million tons of fly ash produced annually, but only 20% of it used, mainly in building industry. To increase this number we can use it as a secondary raw material for example hydraulic cements, concrete fillers and to produce geopolymers. The geopolymer is a synthetic aluminium-silicate binder material which can be produced by reaction between silico- aluminate oxides and alkali silicates in alkaline medium.

Present paper based on the previous researches (production of foam glass, developing of a geopolymer binder). The aim of the work was to develop a geopolymer-foam pebble composite. During laboratory experiments it was produced different sized (2...4, 4...6, 6...8, 8...10 mm) foam pebbles from the following raw materials; ground glass, Sodium Bentonite, Dolomite. The powder mixture was pelletized, dried and heat cured at different temperatures (800, 850, 900 °C) and residence times. After it the pellets were classified. Geometrical characteristics determined by measuring diameters of pellets. Investigations with optical microscope were also carried out. The aim of foam pebble production experiments was to reach a product which has small density, mainly closed and homogenous pores. The optimal pellets mixed to geopolymer binder as aggregate. Binder made from mechanically activated fly ash and activator solution (Sodium hydroxide and sodium-potassium silicate solution). In case of composite experiments changing parameters was; diameter and amount of foam pebbles. The diameter, length and mass of composites was measured to determine specimen density. Compressive strength tests were carried out in 7 days age. The macrostructure of specimens investigated by optical microscope.

After experiments results was evaluated and conclusions were taken.