

This topic is “practice ready.” Yes No

Investigating fly ash-based geopolymer in pervious concrete for removal of heavy metals in urban stormwater runoff

Guyu Shi¹, Kejin Wang², Say Kee Ong³

Abstract

Pervious concrete have been promoted as an environmentally friendly and sustainable infrastructure by allowing water to percolate through its voids which, in turn, reduces surface water runoff, increases groundwater recharge, and attenuates water pollution. The particles in the stormwater runoff are retained and trapped in the pore spaces of the permeable system while some of the pollutants are sorbed onto or interact with the solid surfaces. Recently, fly ash has been used as an alternative source to make geopolymer, a new binder or cement roughly comparable to hydrated cement in appearance, reactivity and properties. The alumina and silica in fly ash can be activated with alkaline solution to form geopolymer. Also, fly ash-based geopolymer is potential to adsorb pollutants in water, i.e. toxic heavy metals. This study investigates the use of a geopolymer binder for making pervious concrete which comprises Class C fly ash, alkali (i.e. sodium silicate and sodium hydroxide solution), and coarse aggregate. The physical and mechanical properties of the pervious geopolymer concrete were tested. The simulated contaminated stormwater with heavy metal (i.e. Cu, Zn, Pd) were analyzed after flow through the concrete sample. Experiments are ongoing and obtained data will undoubtedly be beneficial for the future use of fly ash-based geopolymer in the construction of pervious concrete which will lead to the reduction of cement consumption and environmental problems.

Keywords: pervious concrete, fly ash, geopolymer, heavy metals, stormwater

¹ Graduate Student, e-mail: shiguyu@iastate.edu

² Professor, e-mail: kejinw@iastate.edu

³ Professor, e-mail: skong@iastate.edu

Department of Civil, Construction and Environmental Engineering, Iowa State University, Ames, Iowa, 50011,
Tel. No. 515 294 3927, Fax. No. 515 294 8216