OPEN ACCESS Freely available online

Journal of Geography & Natural Disasters

Short Communication

Development of green fly ash geopolymer for sustainable construction: A journey from green house to green home through bacterial catalyst

Brajadulal Chatopadhyay

Jadavpur University, India

ABSTRACT

Production of cement releases huge CO2 (about 5-7% of total CO2 emission) in the atmosphere andcauses global warming. Fly ash is a coal combustion by-product that leads to many environmental problems like ground water contamination, spills, heavy metal contamination etc. The uses of different chemicals and additive in concrete composites also sometimes cause health problems which are environmentally unacceptable. Microbiologically incorporated cementitious materials to recuperate the activities and toughness of the concrete structures are a new aspect of research work in the current era. In this study we have designed an eco-friendly bio-engineered Geopolymer by incorporating genetically transformed Bacillus subtilis bacterium to an alkali- activator treated 100% Fly ash material. A novel gene responsible for a thermo stable and high pH tolerant silica leaching enzyme (Bioremediase like; M.W. ~ 28KDa) isolated from hot spring bacterium BKH2 has been utilized for production of high performance Geopolymer. The designed geopolymer showed significantly increased compressive, flexural and tensile strengths, enhanced durability and high temperature tolerance (400 o C) compared to cementitious material. Microstructure analysis showed more compactness, reduced porosity and development of new phases inside the geopolymer matrix. The newly developed 100% Fly ash based Geopolymer can be used as cement-alternative for construction purposes which will not only be eco-friendly but also be sustainable at higher temperature. The spore forming ability of the Bacillus subtilis bacterium will be an added advantage as it will remain active within the Geopolymer matrices and provide the desired effect for quite long time.

Biography

Brajadulal Chattopadhyay is currently working in the Department of Physics, Jadavpur University, India. Prof. Chattopadhyay completed his Master (1987) and PhD (1994) degrees from the University of Calcutta, India and worked at Bose Institute, India and Technical University of Delft, the Netherlands. He has been working in the field of Bio-concrete development by using hot spring anaerobic bacteria to enhance the strength and durability of concrete structures since 2001 and published his work in many internationally reputed journals. He has already supervised 20 PhD students and hold one National and two International patents in his research career.