

EXTRACTION OF SILICA GEL FROM AGRICULTURAL WASTE FOR POZZOLANIC APPLICATION: A REVIEW

Rahimah Embong^{1,2, a}, Nasir Shafiq^{2, b}, and Andri Kusbiantoro^{3, c}

¹Civil and Environmental Engineering Department, Universiti Teknologi PETRONAS, Malaysia

²Faculty of Engineering Technology, Universiti Malaysia Pahang, Malaysia

^aemmariiz13@gmail.com, ^bnasirshafiq@petronas.com.my, ^candri@ump.edu.my

Abstract

Biomass-waste generated from agricultural based industry and Portland cement production process are known to produce negative impacts to the environment quality in which they are situated. However, there is a prospective chance to recycle agricultural waste and convert it into cement replacements material with consideration of several processing methods to activate its pozzolanic reactivity. Role of a pozzolan in improving the properties of cementitious product relies on the additional reaction in cementitious system to form Calcium Silicate Hydrate (C-S-H) structure. Generally, this by-product is converted into reactive ash by incinerating it in high temperature. The conversion of silica ash into gel forms results in further investigation of novel processing method to prepare silica gel that would result in the better control of micro-porous structure, thermal performance, and adsorption level of this pozzolanic product. This article reviews on the recent progress of synthesis of silica gel that encompassing its material background, production processes, applications, and gelification procedure. The article also discusses the integration of several main by products, e.g. oil shale ash, geothermal sludge, and rice husk ash (RHA) into the production of silica gel. Considering its effect to the environment quality, application of silica ash in a gel form as pozzolanic materials in concrete is capable to constitute a new effort in material recyclability and sustainability.

Keywords: agricultural waste, silica gel, pozzolanic reactivity, cement