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www.elsevier.com/locate/ijadhadh

PII: S0143-7496(17)30051-9
DOI: http://dx.doi.org/10.1016/j.ijadhadh.2017.03.002
Reference: JAAD1981

To appear in: *International Journal of Adhesion and Adhesives*

Received date: 22 November 2015
Accepted date: 23 February 2017

Cite this article as: Kumud Deshmukh, Richa Parsai, Avneesh Anshul, Archana Singh, Pooja Bharadwaj, Rainy Gupta, Deepti Mishra and Sudhi SitaramAmritphale, Studies on fly ash based geopolymeric material for coatin on mild steel by paint brush technique, *International Journal of Adhesion an Adhesives,* http://dx.doi.org/10.1016/j.ijadhadh.2017.03.002

Studies on fly ash based geopolymeric material for coating on mild steel by paint brush technique

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Abstract: The present work focuses on the study of five different compositions of fly ash based geopolymeric material with varying silicate: alkali ratio as coating material on mild steel plates. Coated mild steel plates were tested for adhesion strength, heat resistance, fire resistance, water absorption and corrosion resistance characteristics. Minerology, morphology and vibrations of various functional groups present in the developed coating material compositions were evaluated by X-ray diffraction analysis (XRD), scanning electron microscopy (SEM) and Fourier transform infra-red spectral studies (FTIR) respectively. The developed coating material possesses promising fire resistance, heat resistance, corrosion resistance characteristics and mechanical properties.

Key words: Geopolymer, Flyash, Coating, Mild steel

1. Introduction

Geopolymers are two to three dimensional inorganic polymeric materials possessing -Si-O-Al-O- units as repeating structures and are amorphous equivalents of zeolites [1]. They can be prepared by alkali activation of aluminosilicate materials such as calcined clays, fly ash, red mud and blast furnace slag. They are termed as green materials due to the energy efficient manufacturing process employed in their formation resulting in low carbon emissions and bulk utilization of industrial waste. This promotes environmental benefits via pollution mitigation [2**]**. The basic steps involved in geopolymerisaton are: i. Dissolution of aluminosilicate materials in strong alkaline solution ii. Formation of oligomers iii. Polycondensation and iv. geopolymerisation[3**]**.

Geopolymers possess a wide application spectrum in areas such as toxic waste encapsulation, prefabricated materials, drug delivery and as corrosion and fire resistant coating materials[4]. Further, geopolymer based coating materials have attracted increasing attention as they do not suffer from drawback relating to, for example, lack of vapour pressure release, UV degradation