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## EFFLORESCENCE MITIGATION BY POZZOLANIC INDUSTRIAL BY-PRODUCTS

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**Abstract:** This study focuses on the effectiveness of pozzolanic industrial by-products namely Fly Ash Class F (FA) and Silica Fume (SF) as partial cement replacements in reducing efflorescence on the surface of Ordinary Portland Cement (OPC) mortar. The early hydration behaviour of Pozzolanic Modified Mortar (PMM) that hypothetically affects efflorescence has been investigated physically using Puddle Test (PT), Standard Chemical Method (SCM), and Electrical Conductivity Test (ECT); mechanically using Compressive Strength Test (CS); and morphologically using Scanning Electron Microscopy (SEM). FA and SF of 10%, 20% and 30% cement replacements as PMM and Unmodified Cement Mortar (UCM) samples were prepared with water-to-cement ratio (w/c) of 0.4. All samples were cured in the concrete laboratory at daily room temperature (T) and relative humidity (RH) in the range of 18-28°C and 65-90%, respectively. Results showed 10%SF reduced efflorescence up to 52.9% in comparison to UCM. The decreased in ECT and the 12.64% increased strength evidently substantiated the EI results. Based on this study, more than 30% cement replacement is detrimental for efflorescence mitigation. It might be due to the lack of water content to initiate pozzolanic reaction because of the agglomeration of fine SF particles.

**Keywords:** *Efflorescence, fly ash, silica fume, mortar*

### 1.0 Introduction

Efflorescence is a deposit of crystallized calcium carbonate (CaCO<sub>3</sub>) on exposed surfaces of cement based products (CBP) manifesting from hazy white layers to thick