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# Statistical Modeling of Thermal Conductivity for Cement-Based Foam

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## Abstract

This paper presents the formulation of two multivariate regression models for predicting the thermal conductivity of cement-based foam through statistical analysis. The cement-based foam was produced by replacing Portland cement with fly ash, silica fume, and metakaolin, up to 20% by mass, for densities that ranged from 400 to 800 kg/m<sup>3</sup>. In the first formulation, the porosity, moisture content and the thermal conductivity of the solid cement paste were considered as independent variables. The results reveal the presence of multicollinearity among these independent variables. In the second formulation, the porosity, mass ratio of the pozzolanic admixture in the binder and the maturity (in days) were taken as independent variables. This model was found statistically significant and was validated against a range of independent experimentally found values for thermal conductivity.

*Keywords: thermal conductivity; fly ash; metakaolin; silica fume; statistical modeling; spss.*

## 1. Introduction

In recent decades, the high cost of energy has made insulating materials attractive. The construction industry seeks sustainable solutions to achieve better thermal insulation. The cement-based foam

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