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A Model of Foam Density Prediction for Expanded Perlite Composites

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Abstract : Multiple sets of variables associated with expanded perlite particle consolidation in foam manufacturing were analyzed to develop a model for predicting perlite foam density. The consolidation of perlite particles based on the flotation method and compaction involves numerous variables leading to the final perlite foam density. The variables include binder content, compaction ratio, perlite particle size, various perlite particle densities and porosities, and various volumes of perlite at different stages of process. The developed model was found to be useful not only for prediction of foam density but also for optimization between compaction ratio and binder content to achieve a desired density. Experimental verification was conducted using a range of foam densities (0.15–0.5 g/cm3) produced with a range of compaction ratios (1.5-3.5), a range of sodium silicate contents (0.05–0.35 g/ml) in dilution, a range of expanded perlite particle sizes (1-4 mm), and various perlite densities (such as skeletal, material, bulk, and envelope densities). A close agreement between predictions and experimental results was found.

Keywords : expanded perlite, flotation method, foam density, model, prediction, sodium silicate
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