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Prediction of thermal and mass loss behavior of mineral mixture using inferential stochastic modeling and thermal analysis measurement data

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Abstract: Abstract:Characterization methods of material are widely used in different steps of quality control in material sciences and engineering. Such methods are relatively complex according to the considered case. This paper is concerned by a characterization method for mineral material analysis using thermal analysis i.e. Differential Scanning Calorimetric. The thermal analysis is a physical method based on the heating; the sample is heated using a ramped set point of the input temperature, according to its properties, the sample gives a thermal response qualified by endothermic and exothermic reactions: Such responses are fundamental for phase's identification.In mineral industry, different material mixture is used in different stage of manufacturing process; the thermal behavior prediction of mixture between two or more materials is very interesting. The thermal mixture behavior is predicted in basis of individual thermal behavior of each input element and the mixture ratio.A mathematical modeling based on artificial neural network is designed to have a soft sensor for predicting the thermal and mass behavior of the mixture, validation using measurement and prediction uncertainties is also considered.Using such approach, the prediction of the mineral mixture characteristics is given by an implementation of the obtained model using the individual behavior and the mixture proportion of the inputs elements.

Keywords : • Modeling and identification; • Artificial neural network (ANN); • Monte Carlo Simulation (MTCS); • Thermal analysis; • Material/mineral mixture; • Uncertainty of measurement