Modeling epoxy foams exposed to fire-like heat fluxes

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Abstract

A decomposition chemistry and heat transfer model to predict the response of removable epoxy foam (REF) exposed to fire-like heat fluxes is described. The epoxy foam was created using a perfluorohexane blowing agent with a surfactant. The model includes desorption of the blowing agent and surfactant, thermal degradation of the epoxy polymer, polymer fragment transport, and vapor-liquid equilibrium. An effective thermal conductivity model describes changes in thermal conductivity with reaction extent. Pressurization is modeled assuming 1) no strain in the condensed-phase 2) no resistance to gas-phase transport, 3) spatially uniform stress fields, and 4) no mass loss from the system due to venting. The model has been used to predict mass loss, pressure rise, and decomposition front locations for various small-scale and large-scale experiments performed by others. The framework of the model is suitable for polymeric foams with absorbed gases.

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