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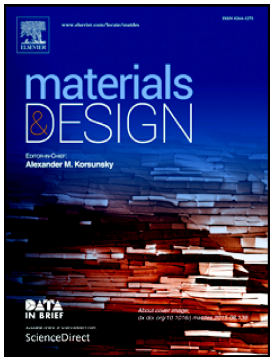

Fire resistance and mechanical properties of enamelled aluminium foam

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Fire resistance and mechanical properties of enamelled aluminium foam

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Abstract

Aluminium foams show very interesting properties for a wide range of applications, in particular good mechanical properties and fire resistance. The particular cellular structure reduces the corrosion resistance of these materials in several environments. The application of a vitreous enamel layer is a possible solution to obtain a good protective barrier that can also improve the resistance at high temperatures. In this work these properties are evaluated for different porcelain enamelled aluminium foam samples. Starting from plate samples of aluminium foam produced by Alporas method, different enamel systems are studied. A frit without vanadium suitable for aluminium substrate was used. Microstructure analysis was made to highlight the adhesion between enamel and metallic substrate, as well as the filling of the open cells and the presence of defects in the glassy layers. The response to flame exposure of enamelled samples was tested in comparison to the uncoated foam. Finally, mechanical properties were studied by 4-points bending tests. This study has shown that the presence of the vitreous enamel coating increases the fire resistance of the aluminium foam. In addition, it was found that the flexural rigidity increases strongly and it is connected with the particle dimension in the frit.

Keywords
Aluminium foam; vitreous enamel coating; fire resistance; mechanical properties