



Ampoule Microcalorimetry for the observation of the Curing Process of an Acrylate Binder in a Pyrotechnic Composition

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The problem concerned the curing of an oxygen sensitive acrylate binder used in a pyrotechnic flare composition. Since the aerobically cured adhesive was known to give a poor quality bond, it was necessary to assess the progress of the anaerobic and aerobic curing processes in order to optimise production. From the two power time curves (Fig. 1 and 2) it can be seen that curing is rapid once all the oxygen in the sealed ampoule is consumed.

The exotherms prior to the main curing peaks reflect oxygen interference with the curing reactions, which lead to the formation of peroxide links in the polymer. Such links contribute to the poor mechanical properties of the material.

If a nitrogen atmosphere is used, this oxygen is residual and absorbed on the flare composition grains, hence the shorter lag before curing. From the integrated curves (Fig. 2) it is obvious that the fraction of poor polymer is considerably reduced upon the exclusion of atmospheric oxygen.



