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Microwave-Induced Interfacial Failure to Enable Debonding of Composite Materials for Recycling

Title Page

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Microwave-Induced Interfacial Failure to Enable Debonding of Composite Materials for Recycling**Abstract**

Buildings or structures consist of materials that are joined to form functional composites to which a wide variety of “surface coatings” is added. Debonding of such composites is necessary to ensure high-quality, material-specific recycling processes. This paper describes tests of the debonding behavior of gypsum plaster and tiles that were attached to various types of concrete or wall materials such as brickwork, calcium silica blocks, or autoclaved aerated concrete. Selective heating with subsequent bond failure was achieved by exposing the interfacial layer of the materials to microwave-active substances. In all specimens subjected to this process, the finishing material was successfully separated from its base by microwave heating. No debonding was achieved in specimens without interfacial switching layer. Laboratory results were confirmed by tests performed using an in-plant demonstrator unit. In these tests, large fragments of gypsum plaster detached from the actual wall materials, which remained undamaged. Tiles also lost their adhesive bond to their base without damaging the latter.

Keywords: Debonding on demand; gypsum plaster; microwaves; susceptors; wall tiles

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