

PHOSPHATE AND PLASTER BONDED SYNTACTIC FOAMS FOR COLLAPSIBLE CORES IN LIGHT METAL CASTING

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In the casting industry so called “lost cores” are used to fabricate cavities in casted components. Those cores are typically made from inorganic materials like sand and have to satisfy a variety of requirements – some of which are contradictory. Among others, they have to be stable against the thermal and mechanical loads of the casting process; they must not be infiltrated by the metal melt or induce chemical reactions detrimental to the performance of the casting. Last but not least demolding has to be easy, i.e. the core has to be destroyed and removed from the casting very easily and without any residues. Especially for small and delicate cores these requirements are very difficult to meet.

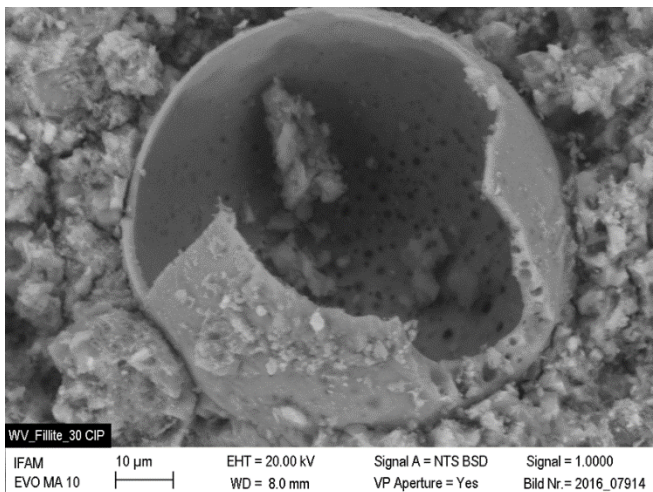


Figure 1 – Fracture surface of a syntactic foam core with cenospheres.



Figure 2 – Contact area of solidified aluminum and syntactic foam core (low pressure die casting).

In a completely new approach syntactic inorganic foams are used as lost cores for aluminum low pressure die casting. Hollow glass microspheres and cenospheres, integrated into the core matrix, lead to a well-controlled fine porosity with closed cells and comparatively high strength of the core, which is required to counter combined mechanical and thermal loads associated with the casting process. Subsequent demolding is done using the high fluid pressure of a cold-isostatic press (CIP). If matrix and sphere strength are suitably adapted, a complete loss of structural integrity of the core can be triggered via the high CIP pressure (up to 3000bar). The residual core material can then easily be removed from the casting as slurry.

In the study presented here, phosphate and plaster bonded syntactic foams were investigated regarding bending strength, surface quality and collapse behavior under high isostatic pressures. 3M™ hollow glass microspheres of grades S22 and S60 as well as cenospheres Fillite 160W were used as filler for syntactic foam production at content levels ranging from 0vol% (reference) to 50vol%. The core behavior during the casting process was evaluated using low pressure aluminum casting experiments performed in permanent moulds, showing that the removal of the cores is in fact possible as envisaged.