New Pattern Designs and Their Experimental and Computational Verification for Light-weight Structured Sand Molds Using Binder-Jet 3D Printing

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ABSTRACT

Additive Manufacturing technology has recently been highlighted as an innovative manufacturing process. Among various 3D printing methods, a binder-et (BJ) 3D printing is particularly known as a technology to produce the complex sand mold quickly for a casting process. However, high manufacturing cost, due to its expensive materials, needs to be lowered for more industrial applications of 3D printing. In this study, we investigated mechanical properties of sand molds with a lightweight structure for low material consumption and short process time. New designe patterns are suggested for lightweight structures of sand molds using the BJ Additive Manufacturing. Experimental tests and FEM-based mecnialcal stress analysis revealed mechaical reponses of our lightweight design applied to the 3D-printed ceramic-polymer composite. It is found that new pattern designs showed good mechanical properties, compared to typical lightweight designs for metals. Our results will be a fundermental technology for new DFAM(Design for Additive Manufacturing) stratergy for indirect AM methods such as Binder-Jet method.

REFERENCES

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