Selection of chemically cured molding sands' with inorganic binders dedicated to 3D sand printing

D. Halejcio, K. Major-Gabryś

AGH Faculty of Foundry Engineering,
Department of Molding Materials, Mold Technology and Foundry of Non-ferrous Alloys

Binder jetting technology

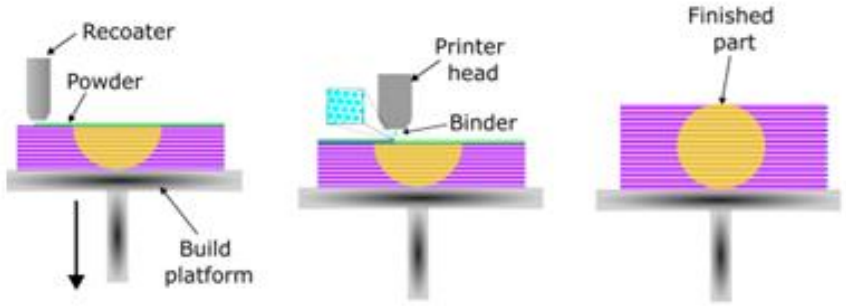

Fig. 1. Scheme of the process of 3D printing of molding sands using the binder jetting method. [8]

Binder jetting technology in the production of casting molds and cores is increasingly used in industry in the production of non-ferrous alloy castings. In additive methods, it is counted among those that do not require additional processing after the printing process is completed. The use of this technique in the production of casting molds and cores makes it possible to obtain a very good quality casting surface.

This paper will demonstrate the feasibility of developing environmentally friendly inorganic binders for 3D printing using commercially available printers. The authors will demonstrate that binders can be developed based on commercial inorganic binders designed to produce molds and cores by classical methods. Various curing technologies possible for current 3D printing technology will be proposed.

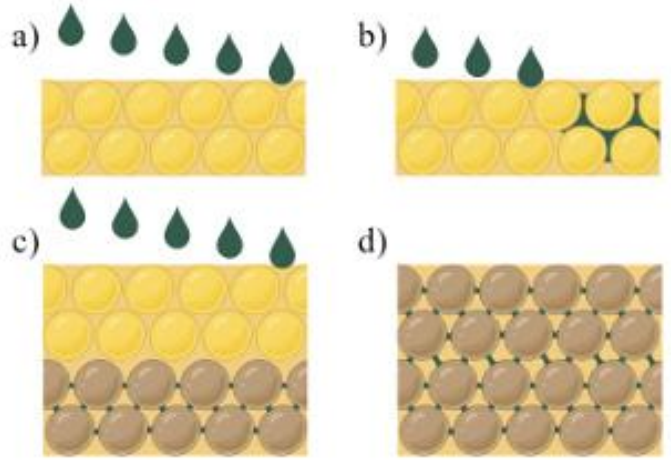

Fig. 2. Illustration of printing process in binder jetting 3D system: a) droplets of liquid binder are applied to layer of matrix; b) binder surrounds sand grains; c) droplets of binder applied to new layer of matrix; d) matrix grains connected by resin bridges [2]

Conclusions

The following conclusions can be drawn from the presented research:

1. The physicochemical properties of commercial inorganic binders can be adapted to the parameters of binders for 3D printing,
2. A_{3D} and B_{3D} binders together with commercial hardeners can be used for the chemical bonding process during 3D printing.
3. Molding sands cured by Flodur 5 hardener show the most optimal technological parameters,
4. C_{3D} binder with dedicated hardener, due to its low technological properties, is not dedicated to chemical curing, which does not mean rejecting it in further research.

Future research will be focused on optimizing the chemical hardening process of molding sands with inorganic binders.

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