

## Monitoring of the Structure and Quality of Aluminium Castings in Moulds of Gypsum Mixtures

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The paper deals with the production of dimensionally accurate castings of aluminum alloys in moulds of gypsum moulding mixture. This manufacturing process is very important for the production of castings for radio technology. Castings have high dimensional accuracy and high - quality of surface. Production of aluminum alloy castings in moulds of gypsum mixtures belong to a group of non-traditional methods of casting and foundry practice, this method is used for the production of special castings. Moulds and cores from gypsum mixture have specific application not only in the production of aluminum alloy castings but cast alloys with low melting temperature (tin, zinc, lead). In these days this method produces dimensionally accurate parts with high surface smoothness such as those used for radio-communication systems or propeller small blowers. Under the conditions of the Czech foundry at our institution, the Department of Engineering Technology - TU of Liberec, we devote this method for many years. The main attention is paid to the methodology for the production of gypsum moulds and their heat treatment and the correct choice of the chemical composition of the aluminum alloy in order to obtain high-quality castings.

**Keywords:** Structure, Quality, Aluminium alloy, Mould of gypsum mixtures, Castings.

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### References

- [1] Degarmo, E. Paul et al. (2003) *Materials and Processes in Manufacturing*, 9th ed., Wiley, ISBN 0-471-65653-4
- [2] RUSÍN, K. (1981) *Disperzní formovací materiály*. [Skripty]. VUT-FSI, Brno (in Czech).
- [3] NOVÁ, I. (1986) *Tepelné zpracování forem ze sádrových formovacích směsí* (in Czech). [Doctoral dissertation work]. FS-KSM, VŠST v Liberci (in Czech).
- [4] VILČKO, J., SLOVÁK, S. (1987) *Zlievárenská technológia*. 1. vyd. Bratislava (in Slovak).
- [5] GRÍGEROVÁ, T., et al. (1988) *Zlievarenstvo neželezných kovov*. 1. vyd. Bratislava/Praha 1 (in Slovak).
- [6] RAVINS, T.L., GREVE, D.R. (1990) Fiber reinforced plaster moulds for metal casting. *Composites*, Vol. 21 Iss. 1, January, p. 96.
- [7] BELICA, E. (2004) *Sádrové změsi v umeleckom zlievarenstve*. In: Sborník z mezinárodní konference. Trnava 2004 (in Slovak).
- [8] ČECH, J., PERNIKÁŘ, J., PODDANÝ, K. (2009) *Strojírenská metrologie I*. 3. vyd. Brno: Akademické nakladatelství. CERM s.r. o., 183 s. ISBN 978-80-214-4010-4. (in Czech).
- [9] ČSN EN ISO 4287, (1999) Geometrické požadavky na výrobky (GPS) - *Struktura povrchu: Profilová metoda - Termíny, definice a parametry struktury povrchu*. Praha: Český normalizační institut, (in Czech).
- [10] WEISS, V., STŘIHAVKOVÁ, E. (2012) Influence of the homogenization annealing on microstructure and mechanical properties of AlZn5.5Mg2.5Cu1.5 alloy. *Manufacturing Technology*. Vol. 12, No. 13 pp. 197-202. ISSN 1213-2489.
- [11] MICHNA, Š., NÁPRSTKOVÁ, N. (2012) The use of fractography in the analysis of cracking after formed workpiece blank mechanical machining from the AlCuSnBi alloy. *Manufacturing Technology*. Vol. 12, No. 13 pp. 174 – 178. ISSN 1213-2489.
- [12] HURTALOVÁ, L. TILLOVÁ, E. (2013) Elimination of the negative effect of Fe – rich intermetallic phases in secondary (recycled) aluminium cast alloy. *Manufacturing Technology*. Vol. 13, No. 1, pp. 44 – 50. ISSN 1213-2489.
- [13] LIPINSKI, T. (2011) Microstructure and mechanical properties of the AlSi13Mg1CuNi alloy with ecological modifier. In: *Manufacturing Technology*. Vol. 11, No. 11, pp. 40 – 44. ISSN 1213-2489.
- [14] LIPINSKI, T. (2011) Use properties of the AlSi9Mg alloys with exothermal modifier. In: *Manufacturing Technology*. Vol. 11, No. 11, pp. 174 – 178. ISSN 1213-2489.

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