Vanadium and Chromium Impact to Microstructure of AlSi10MgMn Alloy with Elevated Iron Content

Maria Zihalova, Dana Bolibruchova
Department of Technological Engineering, Faculty of Mechanical Engineering, University of Zilina, Univerzitna 8215/1, 010 26 Žilina. Slovak Republic. E-mail: maria.zihalova@fstroj.uniza.sk, danka.bolibruchova@fstroj.uniza.sk

In Al-Si alloys iron as an impurity causes decreasing of mechanical and foundry properties of castings. Nowadays is paid attention to adding different elements into aluminium alloys to increase the properties of final castings. Some elements eliminates iron by changing iron intermetallic phase morphology, decreasing its extent and by improving alloy properties. Also there is a possibility of using lower amounts of more elements, what can lead to change of morphology and to improve casting properties at the same time. The contribution is devoted to vanadium and combined vanadium and chromium impact to AlSi10MgMn alloy with high iron level. This effect is evaluated through microstructural analysis using different etchants. Colour metallography is also used to find the better and faster identification of the intermetallic phases.

Keywords: Secondary Al alloys, Iron influence, Vanadium, Mutual V and Cr influence, Microstructure

Acknowledgement

This work was created in the framework of the grant project VEGA N° 1/0363/13. The authors acknowledge the grant agency for support.

References

[1] TILLOVA, E., CHALUPOVA, M. (2012). Solution treatment effect on microstructure and mechanical properties of automotive cast alloy. In: *Materials Engineering*, Vol. 19, pp. 39 - 46.

[2] KUMARI, S.S.S., PILLAI, R.M., RAJAN, T.P.D., PAI, B.C. (2007). Effects of individual and combined additions of Be, Mn, Ca and Sr on the solidification behaviour, structure and mechanical properties of Al-7Si-0.3Mg-0.8Fe alloy. In: *Material Science and Engineering A*, Vol. 460-461, pp. 561 – 573.

[3] DINNIS, C.M., TAYLOR, J.A., DAHLE, A.K. (2005). As-cast morphology of iron-intermetallics in Al-Si foundry alloys. In: *Scripta Materialia*, Vol. 53, pp. 955 – 958.

[4] TAYLOR, J.A. (2012). Iron-containing intermetallic phases in Al-Si based casting alloys. In: *Procedia Materials Science*, Vol. 1, pp. 19 – 33.

[5] TAYLOR, J.A. (2004). The effect of iron in Al-Si casting alloys. In: *35th Australian Foundry Institute National Conference*, pp. 148 – 157, Adelaide, South Australia.

[6] BOLIBRUCHOVA, D., ZIHALOVA, M. (2013). Possibilities of iron elimination in aluminium alloys by vanadium. In: *Manufacturing technology*, Vol. 13, No. 3, pp. 289 -296.

[7] CAO, X., CAMPBELL, J. (2006). Morphology of Al5FeSi phase in Al-Si cast alloys. In: *Materials Transactions*, Vol. 47, No. 5, pp. 1303 -1312.

[8] PETRIK, J., HORVATH, J. (2011). The iron correctors in Al-Si alloys. In: *Annals of faculty engineering Hunedoara*, Vol. 9, No. 3, pp. 401 – 405.

[9] MONDOLFO, L.F. (1943). *Metallography of Aluminium Alloys*. pp. 351. USA.

[10] TILLOVA, E., CHALUPOVA, M. (2009). *Structural analysis of Al-Si cast alloys*, pp. 191. EDIS, Žilina.

[11] ASM. (1992). *ASM HANDBOOK. Vol. 9: Metallography And Microstructures*.

[12] KUCHAR, L., DRAPALA, J. (2003). *Binary systems aluminium-admixture and their importance for metallurgy*. pp. 218. Delta Print, Decin.

[13] BOLIBRUCHOVA, D., RICHTARECH, L. (2014). Effect of the AlCr20 addition on the microstructure of secondary AlSi7Mg0.3 alloy. In: *Archives of foundry engineering*, Vol. 14, No. 2, pp. 9 – 12.

[14] HURTALOVA, L., TILLOVA, E. (2013). Elimination of the negative effect of Fe-rich intermetallic phases in secondary (recycled) aluminium cast alloy. In *Manufacturing Technology*, Vol. 13, No. 1, pp. 44-50

[15] BRUNA, M., KUCHARCIK, L., SLADEK, A. (2013). Complex evaluation of porosity in A356 aluminium alloy using advanced porosity module. In *Manufacturing Technology*, Vol. 13, No.1 pp. 26–30.

Paper number: M201494