THE EFFECT OF GRAIN-REFINEMENT ON Zn-10Al ALLOY DAMPING PROPERTIES

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1. Introduction
ZnAl-based foundry alloys of increased Al content have enhanced damping properties. On the other hand they show a coarse grain-structure after solidification in sand moulds, which decreases their ductility. The refinement of the coarse macrostructure positively influences plastic properties but the increased structure fineness can decrease the damping properties. This work is aimed at presenting results of the influence of Zn-10Al sand-cast alloys grain-refinement with the Al-3Ti-0.15C master alloy on the alloy damping properties measured by the attenuation coefficient changes.

2. Experimental
The system used during these examinations was Zn-10 wt.% Al (Zn-10Al) binary alloy inoculated with the commercial Al-3 wt.% Ti – 0.15 wt.% C Al-3Ti-0.15C (TiCAl) master alloy. The Zn-10Al alloy was melted from Zn and Al of min. purity 99.99%. The melting, casting and inoculation of the Zn-10Al was performed in the same manner as previously described in detail in [1 – 3]. The measurements of damping properties were performed using the Krautkramer USLT 2000 device and the attenuation of 1 MHz ultrasound wave - Fig. 1, [3 – 5].

Fig. 1. Left: Krautkramer USLT 2000; Right: Exemplary image of peaks in an echogram of the examined Zn-10Al alloy
3. Results and discussion
The results of the attenuation coefficient changes vs. addition of Ti, obtained during the performed measurements, are shown in Fig. 2. From the Fig. 2 it can be seen that the addition of TiCAl master alloy, in the amount of about 25 - 400 ppm, generally decreases the attenuation coefficient with comparison to the initial, no nodified alloy. However, the observed decrease is only 15 – 25%, so also detail examinations on the influence on strength properties should be performed to evaluate a total influence of the applied inoculation on the mechanical properties. This will be presented in a close future in [5].

![Figure 2](image)

**Fig. 2.** Summary of the effect of the addition of Ti in the Al-3Ti-0.15C (TiCAl) master alloy on the mean value of attenuation coefficient

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References