

Title: Investigation of defects in quasicrystals

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Abstract: In the present work defects in WE43-based alloys modified by addition of Zn and ternary Mg-Zn-Y alloys were studied by positron lifetime spectroscopy and coincidence measurement of Doppler-broadening of annihilation radiation. Icosahedral phase $\text{Mg}_3\text{Zn}_6\text{Y}_1$ with quasicrystalline structure was recently observed in Mg-Zn-Y system and attracts great attention of researchers due to its unique properties. Positron lifetime spectroscopy revealed that positrons are trapped at a special kind of vacancy-like defects located at interfaces between the Mg matrix and icosahedral phase in the studied alloys. Heat treatment of studied alloys leads to marked changes in the morphology of secondary phases. Since the vacancy-like defects are located at the surface of icosahedral phase, heat treatment significantly influences their concentration.

Samples processed by equal-channel angular pressing were investigated to elucidate the influence of ultra-fined-grained structure on types of defects present in the studied alloys. The temperature stability of the ultra-fined-grained structure was studied by positron lifetime spectroscopy and microhardness measurements of isochronally annealed samples. Phase transformations were examined by *in situ* X-ray diffraction and differential scanning calorimetry in the as-cast alloys as well as the samples deformed by equal-channel angular pressing.

Keywords: quasicrystals, defects, Mg-alloys, positron annihilation