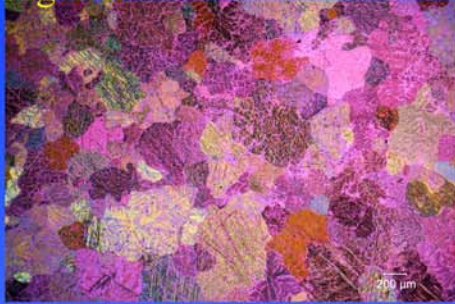


# In-situ heterogeneous nucleation of a new grain refiner in Mg-Al-Re alloys

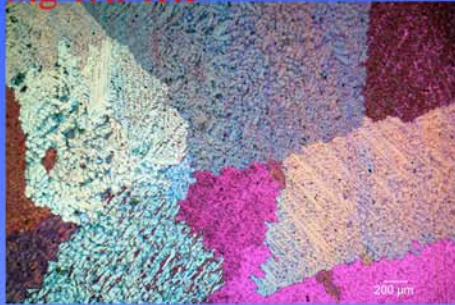
D. Qiu<sup>1,a</sup>, M-X. Zhang<sup>1,b</sup> and P. M. Kelly<sup>1,c</sup>

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Mg-1Al



Mg-1Al-1Re



Mg-1Al-3Re



Mg-1Al-5Re



Mg-1Al-10Re

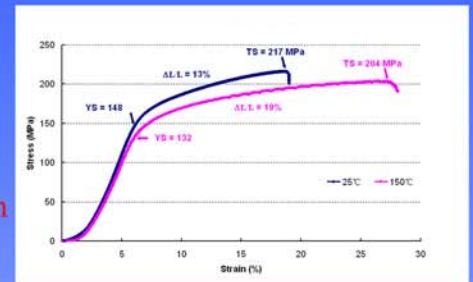


500μm

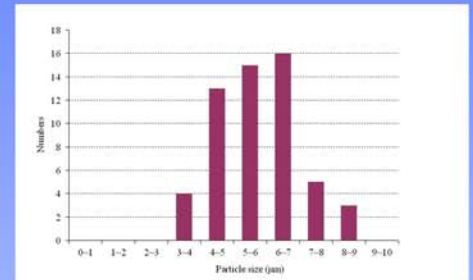
Grain refinement for Mg-Al based alloy has been a challenging issue for decades. Unlike most of previous efforts that focused on direct addition of grain refiners contained in a master alloy, we recently developed a new grain refiner that can be in-situ formed in the melt by adding certain amount of Rare earth element. This grain refiner shows great efficiency for Mg-1Al alloy. The grain size can be reduced from 330μm down to 40μm once the addition of the rare earth element exceeds a critical amount even though grain coarsening occurs at beginning. The actual mechanism of the grain refinement is not fully understood, it is believed that both the heterogeneous nucleation on in-situ formed compounds and the growth restriction factor provided by the Rare earth element are corporately responsible for the refinement.

Grain size reduction

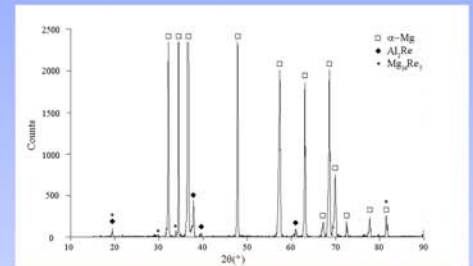
Tensile test results of Mg-1Al-10Re alloy at solution treated status. The excellent ductility comes from the uniform fine grains.



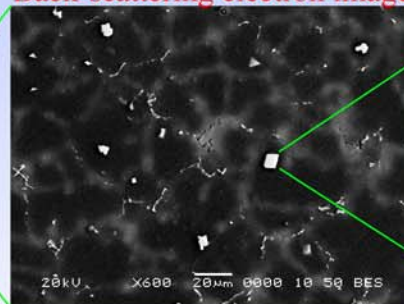
Particle size statistics of the grain refiner in Mg-1Al-10Re alloy. Effective grain refiner ranges from 4~7μm.



XRD examination to Mg-1Al-10Re alloy showing the structure of the grain refine



Back-scattering electron image



EDS analysis to the grain refiners

