Growth restriction factor influence on grain structure development in high pressure die cast magnesium-aluminium binary alloys

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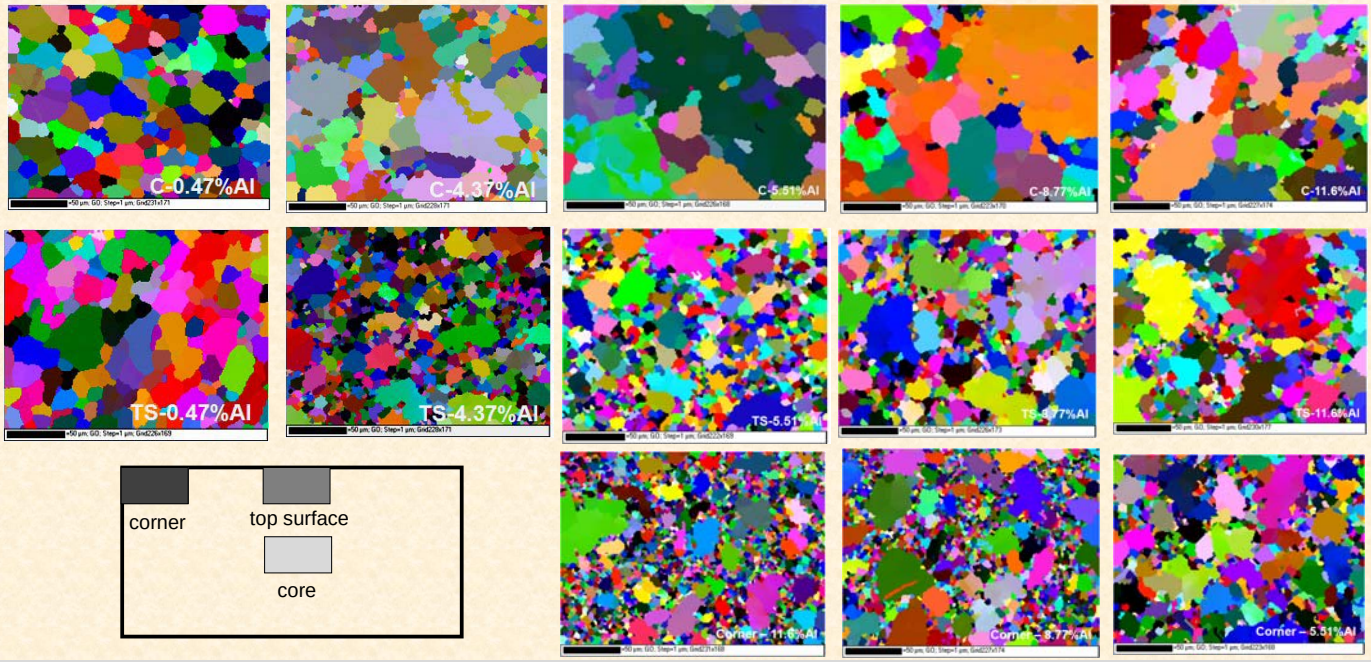
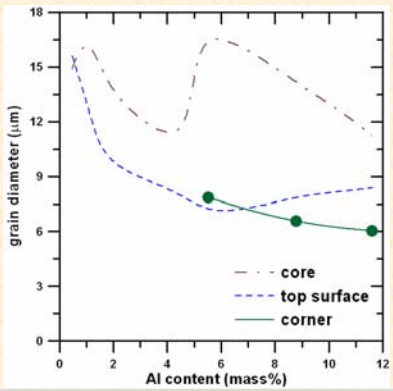
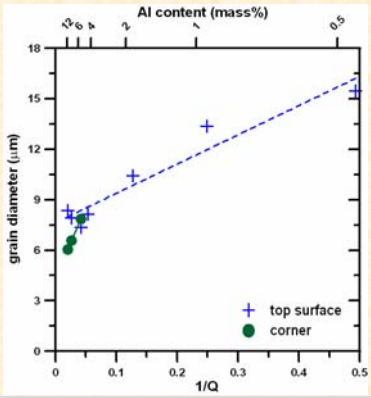
- The grain microstructure at different locations on the tensile cross-section of high pressure die cast (hpdc) Mg-Al alloys, with solute contents of 0.47 to 11.6 mass%Al, has been characterized using scanning electron microscope with electron back scatter diffraction (EBSD) detector
- The extent to which the grain size follows the relationship $d = a + b/Q$ has been assessed
  d – grain diameter, a and b are constants depends on cooling rate and thermal gradients
  Q – growth restriction factor
  $Q = mc_o(k-1)$; m – slope of liquidus line, c_o – solute concentration, and k – partition coefficient



EBSD grain orientation maps from the core (C), top surface (TS), and corner regions of hpdc Mg-Al binary alloys



The mean grain diameter at different locations as a function of the solute content



The mean grain diameter at the top surface and corner regions as a function of reciprocal of Q

- The grains formed in the die cavity fits the relationship between the grain diameter and reciprocal of growth restriction factor, albeit a and b values are much lower in comparison with slowly solidified alloys