Nanoscale Kirkendall Effect on Central Macrosegregation in TRC Al 3003 Alloy

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Abstract. Al-Mn alloys exhibit a good combination of adequate strength, excellent corrosion resistance and formability. Twin-roll casting has a high potential for industrial applications however, one of the drawbacks is an inhomogeneous structure generated by macrosegregation, which appears under certain conditions in the center of sheets during solidification. Evolution of TRC sheet with composition 1 wt.% Mn, 0.2 wt.% Fe, 0.5 wt.% Si, 0.2wt% Cu and small addition of Zr (0.2 wt.%) and Cr (0.1 wt.%) was studied during isothermal annealing at 450 °C by X-ray computed tomography, light optical microscopy and scanning electron microscopy. Central macrosegregation exhibit formation of porosity or voids after annealing as a result of Kirkendall effect. High diffusivity of silicon in aluminum matrix leads to the dissolution of Si clusters located in a vicinity of Al-Mn-Fe segregation predominantly in a form of long segregation channels.