

포스터 B-7

Measurement of Lattice Parameter of Primary Si Crystal in Stircasting by CBED Method.

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The morphological changes of primary solid particles as a function of process time on hypereutectic Al-15.5wt%Si alloy during semi-solid state processing with a shear rate of 200 s^{-1} are studied. The primary Si crystals are fragmented in the early stage of stirring and morphologies of primary Si crystals change from faceted to spherical during isothermal shearing for 60 minutes at $580 \text{ }^\circ\text{C}$. To understand the role of Al dissolved in the primary Si crystal by shear stress at high temperature, lattice parameters of the primary Si crystals are determined as a variation of HOLZ line positions measured from CBED pattern. Results from these investigations indicate that the lattice strain of the primary Si crystal in the stircast Al-15.5wt%Si alloy shows tensile strain greater than that of the gravity casting. Average values of the lattice parameter in stircasting is 0.54391 nm and in gravity casting, it is 0.54329 nm . Increase of the lattice parameter by stircasting is due to the increased amount of Al equilibrium concentration dissolved in the primary Si crystal accelerated by shear stress at the high temperature. The amounts of solute Al in the primary Si crystal are measured quantitatively by EPMA method to confirm the CBED analysis.

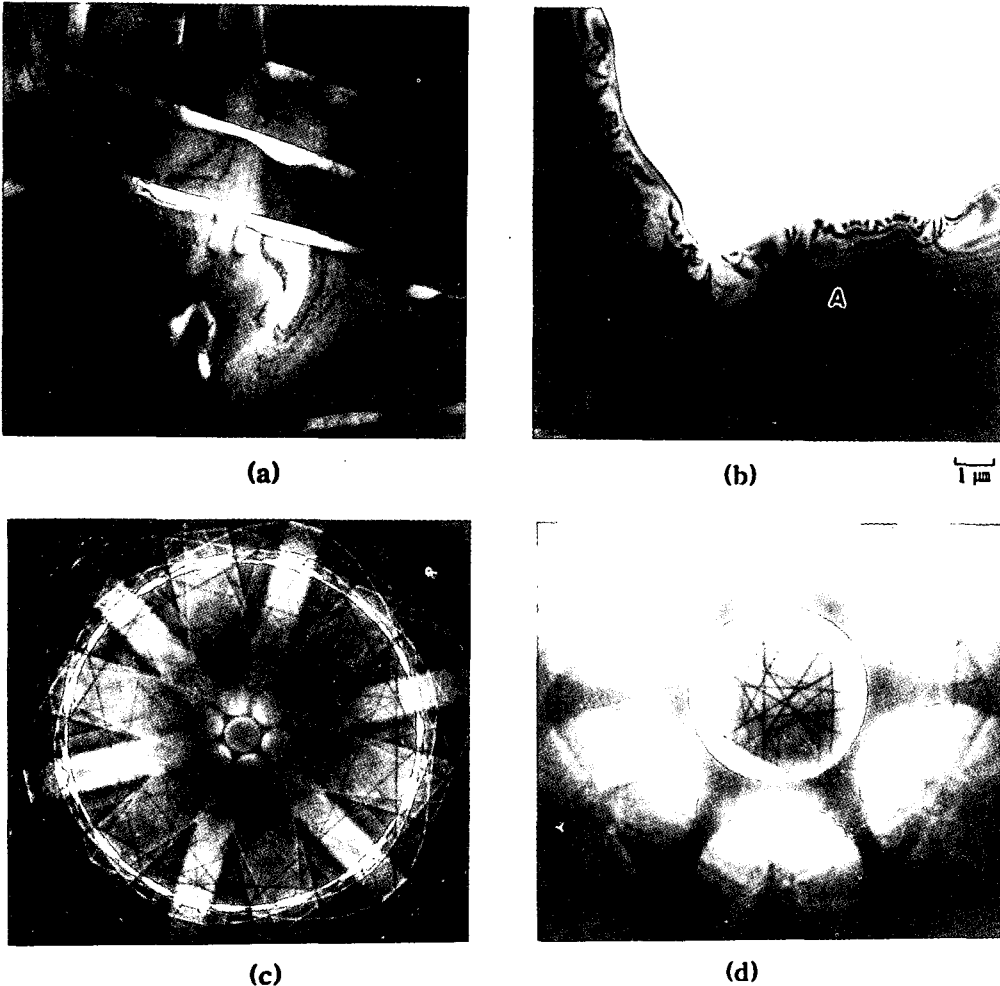


Figure : BF image and CBED patterns of stircast Al-15.5wt%Si alloy :

(a) BF image showing eutectic silicon and Al matrix, (b) BF image of the primary silicon crystal, (c),(d) HOLZ [111] pattern taken from the area A in (b).