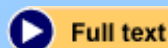


## TOPICAL REVIEW

## Texturing by cooling a metallic melt in a magnetic field

Robert F Tournier *et al* 2009 *Sci. Technol. Adv. Mater.* **10** 014501 (10pp) doi: [10.1088/1468-6996/10/1/014501](https://doi.org/10.1088/1468-6996/10/1/014501) [Help](#)



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**Abstract.** Processing in a magnetic field leads to the texturing of materials along an easy-magnetization axis when a minimum anisotropy energy exists at the processing temperature; the magnetic field can be applied to a particle assembly embedded into a liquid, or to a solid at a high diffusion temperature close to the melting temperature or between the liquidus and the solidus temperatures in a region of partial melting. It has been shown in many experiments that texturing is easy to achieve in congruent and noncongruent compounds by applying the field above the melting temperature  $T_m$  or above the liquidus temperature of alloys. Texturing from a melt is successful when the overheating temperature is just a few degrees above  $T_m$  and fails when the processing time above  $T_m$  is too long or when the overheating temperature is too high; these observations indicate the presence of unmelted crystals above  $T_m$  with a size depending on these two variables that act as growth nuclei. A recent model that predicts the existence of unmelted crystals above the melting temperature is used to calculate their radius in a bismuth melt.

**Keywords:** magnetoscience, magnetic processing, nucleation, magnetic texturing, undercooled liquids, intrinsic nuclei, magnetic susceptibility, metallic melt, crystallization

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