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Study on hot deformation behavior and intrinsic workability of 6063 aluminum alloys using 3D processing map

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Abstract

Hot deformation in 6063 aluminum alloys was investigated by hot compression testing over the temperature range of 573–723 K with strain rates of 0.01–10 s^{-1} using a Gleeble 3500 thermal-mechanical simulator. Based on the experimental results, constitutive equations compensated with strain were developed to model the hot deformation behavior. The intrinsic workability was further analyzed by establishing three-dimensional processing maps. These maps were constructed based on dynamic materials model to delineate variations in power dissipation efficiency and flow instability domains. Combined with microstructure observation, recommended processing domains are predicated to be within the temperatures range of 673–723 K and strain rates range of 0.01–0.1 s^{-1}. Under such conditions, the main softening mechanism is dynamic recrystallization. The results from these processing maps agree well with microstructure observation.

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