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# Deformation of the shrinkage pore in 7050 aluminum alloy during rolling process

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## ABSTRACT

Deformation behavior of the shrinkage pore in 7050 aluminum alloy during rolling process was simulated by Finite Element Method (FEM). In present work, two models, which are the macro rolling model and the micro cell model, were built to simulate the macro deformation of sheet ingot and micro deformation of shrinkage pores. The macro rolling model neglecting the pore was built based on practical rolling parameters of 7050 aluminum alloy sheet ingots, and the micro cell model including a shrinkage pore which is full of gas was built based on 3D X-ray computed tomography and mesh reconstruction technologies. The deformation history of typical elements was extract from the macro rolling model, and it was set as the boundary conditions of the micro cell model. In the micro cell model, the stress and strain concentrate around the shrinkage pore, but the influencing zone is limited in 10 times of the maximum size of the pore. The deformation of the shrinkage pore with complex shape is much different from the spherical gas pore. The sub-surfaces of shrinkage pore are easy to contact with each other at the stress states of rolling process with large reduction. The results indicate that the combination method of macro and micro model was available to calculate the problem with units of extremely large size difference.

**KEYWORDS:** aluminum alloy, shrinkage pore, deformation, rolling, finite element method