Porosity closure in aluminum alloy thick plates for aerospace

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Abstract: Aluminum alloys are omnipresent in aerospace manufacturing thanks to their low density, their good mechanical properties and their high resistance to corrosion. However, their mechanical properties are deteriorated by the presence of pores. Those pores appear during casting and are closed during hot rolling. The present work aims at observing pores within the material during their deformation thanks to X-ray microtomography. Simulations are used to determine the local mechanical loading. It results that pore shape is of prime importance, complex branched pores close differently than spherical pores. Pore orientation also affects closure. Conversely, processing conditions such as temperature or compression velocity have a negligible influence. A simple model of pore closure is proposed and works better than existing models for complex pores deformed in compression.