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# Microstructural evolution and mechanical properties of welding seams in aluminum alloy profiles extruded by a porthole die under different billet heating temperatures and extrusion speeds

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## Abstract

Porthole die extrusion process of aluminum alloy profiles is a hot deformation process involving solid state welding. Microstructural evolution of welding seams is the key factor to determine mechanical properties of extruded profiles. In this work, the grain structure, bonding interface structure and precipitates of welding seams in the profiles extruded under different billet heating temperatures and extrusion speeds were characterized, and the hardness, strength and ductility of welding seams were analyzed. The influence of billet heating temperature and extrusion speed on the microstructure and mechanical properties of welding seams was studied. It was found that, in the porthole die extrusion process of aluminum alloy profiles, fine or coarse grains and micro-voids can be formed in welding seams. Although the new grains through the bonding interface have been formed, there are still many micro-voids in these new grains. Increasing billet heating temperature and extrusion speed not only contributes to the formation of the new grains through the bonding interface, but also promotes the closure of

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