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Role of pre-vertical compression in deformation behavior of Mg alloy AZ31B during super-high reduction hot rolling process

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Abstract: Mg alloy AZ31B plates were processed by hot rolling with different thickness reductions per pass and pre-vertical compression followed by super-high reduction hot rolling (PVCR), respectively. Microstructure evolution, rolling formability variation and mechanical responses were investigated. As reduction per pass increased, the number of shear bands deflecting toward rolling direction increased, resulting in easy crack initiation in and around the bands. With increasing reduction per pass up to 80%, twinning and twinning-induced dynamic recrystallization (DRX) dominated the deformation of the edge material at 350 °C, resulting in local recrystallization with coarse grains and further largest edge-crack degree. Pre-induced $\{10\bar{1}2\}$ tensile twins by pre-vertical compression (PVC) increased number density of nucleation sites for dynamic recrystallization during the subsequent severe rolling, which enhanced the dominant role of continuous dynamic recrystallization. Designed PVCR-b was proved to be a relatively effective method to