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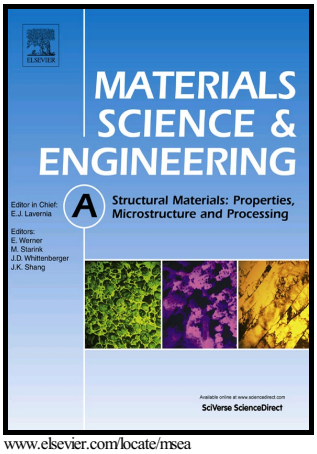


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Abstract

Crystal orientation and mechanical properties of Zircaloy-4 (Zr-4) alloy cladding tube manufactured by cold Pilger rolling and annealing were systematically investigated. Electron Back-Scattered Diffraction (EBSD) analysis showed that grains, which were fully recrystallized in α phase, were strongly oriented with their c axis parallel to the tangential direction (TD) of the tube and, meanwhile, their normal direction of $\{11\bar{2}0\}_{\alpha}$ planes parallel to the axial direction (AD). Compression tests carried out along three loading directions (TD-0°, TD-45° and AD, respectively) at room temperature revealed that the Zr-4 alloy tube exhibit strong yielding anisotropy: TD-0°＞TD-45°＞AD. Meanwhile, the alloy exhibited strain rate hardening effect, since the yield strength increased with the growing strain rate. The relationship between texture and yielding anisotropy of the Zr-4 alloy tube was further discussed based on Schmid factor theory. The Schmid factor values for basal, prismatic and pyramidal <a> slip systems, which were three important yielding mechanisms in Zr-4 alloy during the compression, were calculated depending on the geometric relationship between