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## Dynamic restoration and deformation heterogeneity during hot deformation of a duplex-structure TC21 titanium alloy

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**Abstract:** The coexistence of equiaxed  $\alpha$ , lamellar  $\alpha$  and  $\beta$  phase in a duplex-structure  $\alpha/\beta$  titanium alloy not only benefits the balance between strength and ductility, but also arouses a complicated microstructure evolution during hot deformation. The research objective herein is first to investigate the dynamic restoration mechanism, including dynamic recovery (DRC) and dynamic recrystallization (DRX), of both  $\alpha$  and  $\beta$  phases during hot deformation of a duplex-structure TC21 titanium alloy. The results show that, after deformation, the geometric morphologies of lamellar  $\alpha$  and  $\beta$  phase change more apparently than equiaxed  $\alpha$ . Based on the analysis on the distribution and frequency of misorientation angle, it reveals that DRC and continuous DRX (CDRX) occur in all of equiaxed  $\alpha$ , lamellar  $\alpha$  and  $\beta$  phase, and the increasing deformation temperature restrains the occurrence of CDRX. Synthetically, the correlation between geometric morphology and dynamic restoration is well established. Meanwhile, the heterogeneous degree of DRX indicates a morphology dependent deformation heterogeneity between equiaxed and lamellar  $\alpha$ , and between different local regions in  $\beta$  phase which is closely related

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