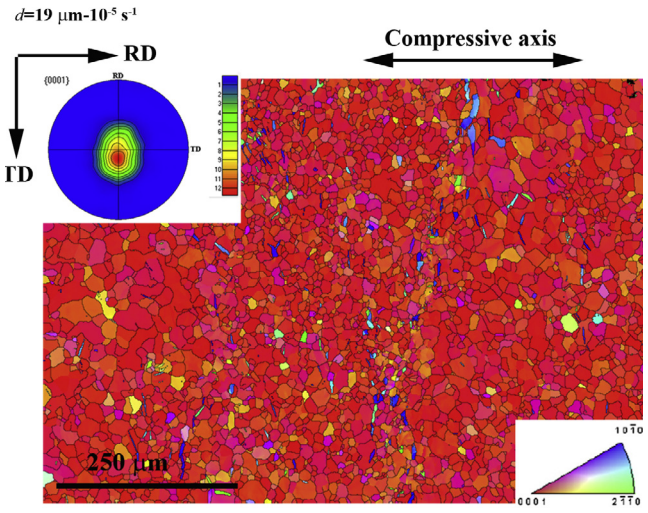

Fig. 10. EBSD IPF map in the ND and {0001} pole figure corresponding to the polycrystal with $d = 19$ μm after a compressive strain of ~10% at 50 °C and 10^{-5} s^{-1}.

at GBs with decreasing strain rate. The connectivity between grains favorably oriented for basal slip, i.e. with $SF_{basal} > 0.2$ (Fig. 11b) can be estimated by calculating the fraction of boundaries with $\theta < 45°$ ($f_{\theta<45°}$), which is 82%, and the fraction of J_2 and J_3 junctions ($f_{J_2+J_3}$), which is 80% (Fig. 11c). $f_{J_2+J_3}$ at 10^{-5} s^{-1} is significantly larger than at 10^{-3} s^{-1} (51%). Therefore, it is our contention that the transition from twinning to basal slip dominated flow that takes place at 50 °C with decreasing strain rate in the pure Mg polycrystal with $d = 19$ μm may be attributed to the enhanced percolation of basal slip transfer between grains favorably oriented for basal slip.

3.3. Twinning to slip transition with increasing temperature

Fig. 12 illustrates the compressive true stress–strain curves corresponding to the pure Mg polycrystal with $d = 19$ μm deformed at 10^{-3} s^{-1} and at 50, 150, and 250 °C. As expected, the yield stress ($\sigma_{0.2}$) and the work hardening rate decrease progressively with increasing test temperature. In addition, the shape of the curve changes gradually from being concave-up at 50 °C to concave-down at 250 °C, consistent with a transition in the dominant deformation mechanism from twinning to slip as the temperature is raised.

Fig. 13a and b illustrates the EBSD IPF maps and the corresponding {0001} pole figures for the polycrystal with $d = 19$ μm after compression at 150 and 250 °C, respectively. As expected, the fraction of twinned grains decreases

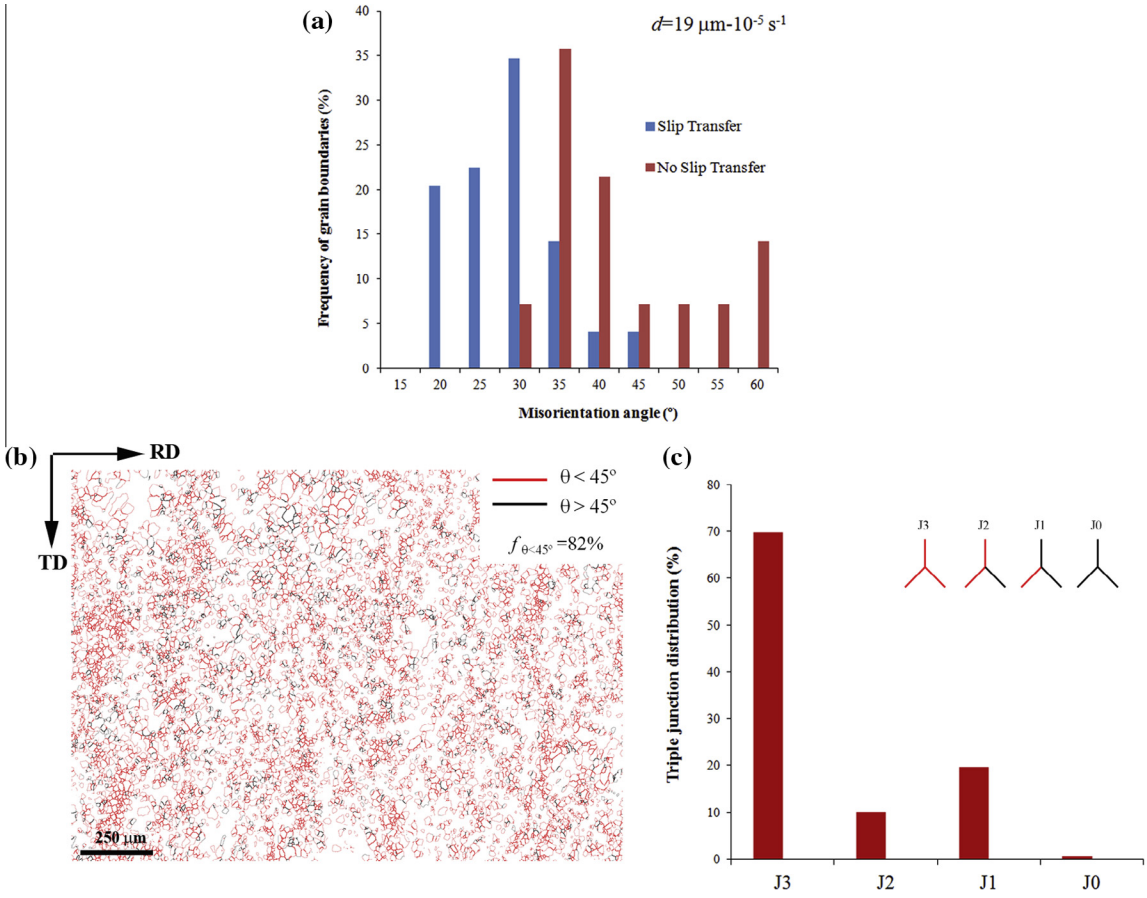

Fig. 11. Polycrystal with $d = 19$ μm tested at 50 °C and 10^{-5} s^{-1}. (a) Misorientation distribution histogram of grain boundaries inside the deformation bands across which basal slip transfer could take place (blue bars) and of those at which slip traces were arrested (red bars); (b) GB map corresponding to the EBSD SF map of Fig. 5a. GBs with $\theta < 45°$ are colored in red while GBs with $\theta > 45°$ are colored in black. (c) The corresponding triple junction distribution histogram is also included. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)