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Texture evolution near the bonding zones of multilayer hcp and fcc explosively welded metals

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A series of explosively welded clads including Ti/Al, Mg/Al, Ti/Cu and Zr/stainless steel were analyzed in terms of texture changes by electron backscatter diffraction (EBSD) and synchrotron diffraction. In this respect, special attention was paid to texture evolution as a function of distance from the interface. Both X-ray diffraction and EBSD measurements reveal significant changes in texture evolution within the joined metals mostly related to high pressure of compression nature and a strong shear component. The so-called base (lower) fcc clads are generally characterized by a typical rolling texture exhibiting copper and brass components with increasing simple shear components (rotated cube and {111}<110>) when approaching the interface. Moreover, very high pressure and shear components produce phase transitions in austenitic steels. Plastic deformation in explosive welding process also changes substantially the texture of flyer (upper) hcp clads producing a much higher twin density and a very strong asymmetry in intensity of two split basal (0002) poles with respect to the normal direction. The observed changes unveil the effect of the explosion on the texture and microstructure of the joined metals and are discussed concerning the type of flyer and base plates, deformation mode and hardening and softening processes occurring during clad formation.

Keywords: Joining; Explosive welding; Texture, EBSD, synchrotron.

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