Characterization of Nanostructured Phases at Interface of Brazing Mo/h-BN using FIB and TEM analysis

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Nanocrystalline materials are constantly been developed and the need for its characterization is always advancing in order to fulfill the requirements of the resulting nanostructured phases and complex precipitates in sub-micron scale interfaces with variation of composition. Characterization of nanocrystalline materials in this work was realized using X-ray diffraction (XRD), scanning electron microscopy with field emission gun (SEM-FEG) coupled with energy dispersive spectroscopy (EDS) and electron backscattered diffraction (EBSD). In order to improve resolution for the characterization of nanoscale phases it was used TEM analysis together with associated techniques: STEM-EDS, HRTEM. The distribution of phases and grain orientation maps were determined with an Automatic Crystal Orientation Mapping (ACOM) system installed in a JEOL JEM 2100F (TEM/STEM) 200kV with field emission gun (FEG). A ASTAR^{TM} NanoMegas system was used for ACOM diffraction data acquisition [1,2]. Usually the step sizes (resolution) adopted in ASTAR mapping starts in 1 nm to 10 nm, and cover areas through the sample from 100 x 100 pixels (nm^2) up to 700 x 700 pixels (μm^2). Crystallographic mapping through ASTAR technique was able to characterize and identify submicron down to nanometric α phase precipitates in PM samples as well as characterize nanograins of β-Ti, nanostructured α and ω phase precipitates in HPT samples, becoming a very useful tool for characterization of β-Ti alloys. Other metallic materials cases were analyzed, such as interfaces in welding explosion of high strength steel with super duplex steel and Inconel 625 Ni alloy, nanocrystalline Ti-Nb thin films, automated GMAW-P welding of Al 5083 alloy, laser clad Fe-based BMG + MoS_2 self-lubricating composites, in its interfaces, nanostructured grains and intermetallic phases.

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