DE LA RECHERCHE À L'INDUSTRIE

Séminaire

Mercredi 14 novembre 2012 à 10h30

Salle de réunion du SRMP – Bâtiment 520 - Pièce 109

Design of new titanium alloys with improved ductility induced by combined TRIP and TWIP effects

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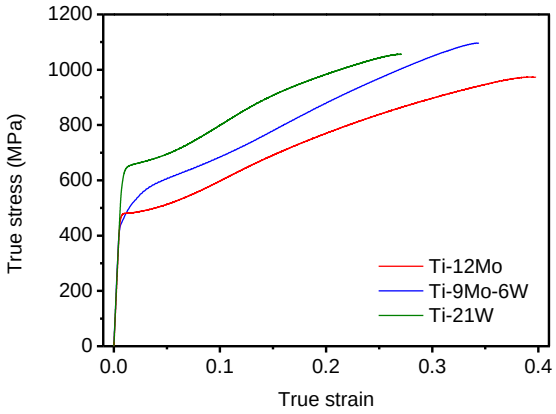
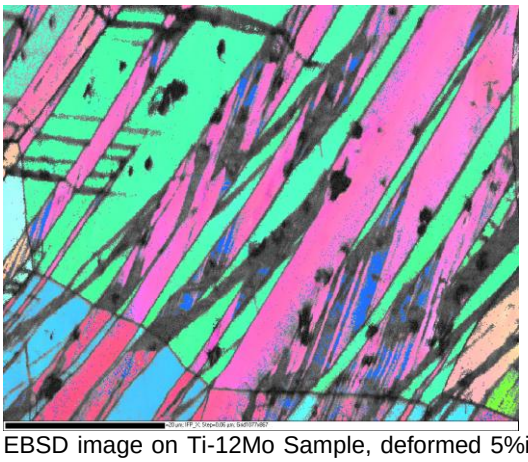
Over the last few decades, the interest for titanium alloys has been continuously increasing for industrial applications, due to a promising combination of high strength, low density and good corrosion resistance. However, both a low ductility (typically <20%) and a lack of strain hardening still constitute a major drawback when compared to steels or Co-Cr based alloys, limiting their potential in advanced applications where combination of strength and large deformation is required. Consequently, there is a huge challenge in developing new titanium materials displaying improved combination of mechanical properties including high plastic deformation capacity.

In this work, results are presented on the ***design of a new family of titanium alloys with high ductility induced by combined transformation-induced plasticity (TRIP) and twinning-induced plasticity (TWIP) effects***. Mechanical tests carried out on a binary and ternary β-metastable Ti based alloy designed by a formulation strategy based on the "d- electron alloy design" show a very high work hardening rate combinated with a high ductility of about 40%. In-situ synchrotron X-ray diffraction (SXRD) and transmission electron microscopy reveal a combined mechanical activation of intense mechanical twinning and both ω and α'' phases stress induced precipitations.



Stess-strain curves on 3 « model » materials displaying combined TRIP/TWIP properties



EBSD image on Ti-12Mo Sample, deformed 5%in tension (intense {332}<113> mechanical twinning)

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