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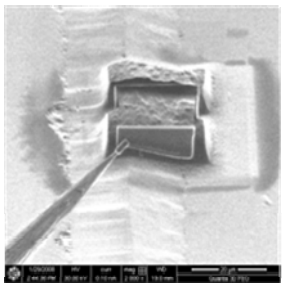
DocMASE Project Proposal 2012-07

Project Title	***Improvement of fatigue performance of TRIP stainless steels***
Main University and Advisor	**Universitat Politècnica de Catalunya (UPC)** (Barcelona, SPAIN) Prof. Antonio MATEO
Second Univ. and Advisor	**Université de Lorraine** (Nancy, FRANCE) Prof. Abdelkrim REDJAIMA
Associated Partner(s)	**Arcelor-Mittal** (Maizières-les-Metz, FRANCE)
Project Description	Metastable stainless steels (also called TRIP stainless steels) are high-performance metals. The term "metastable" describes those steels capable of microstructural changes induced by deformation. They have industrial importance, especially for the transport industry, because they allow increasing safety levels and also developing lighter vehicles. However, there are scarce studies on their fatigue response. The main objective of the project is to generate TRIP stainless steels with higher fatigue performance than those currently available. Different microstructures will be "created" through thermomechanical treatments looking for the best combination of microstructural parameters. To attain this goal, a deep understanding of the relationships between microstructure and deformation mechanisms must be reached. An important aspect will be the use of advanced characterization techniques, such as FIB, EBSD, TEM, Electron Diffraction, FESEM and nanoindentation, together with fatigue and fracture testing.  *Fatigue testing*  *TEM foils extracted by FIB* Experience on those techniques will be an advantage for the application. Also Spanish and French knowledges will be appreciated.
References	1. *Stainless Steel Car Frames: The Next Generation*; Nickel, vol. 24, no. 1, December 2008. 2. *Deformation-induced martensite formation during cyclic deformation of metastable austenitic steel: Influence of temperature and carbon content;* Krupp U, West C, Christ HJ., Mater Sci. Eng. A 2008;481–482:713–17. 3. *In situ transmission electron microscopy investigations of the kinetics of α-$Fe_{16}N_2$ precipitation during the ageing of nitrogen-ferrite,* X.C. Xiong, A. Redjaïmia, M. Gouné, *Scripta Materialia* (2010) 63 (12), pp. 1232-1235. 4. *Influence of the Martensitic Transformation on the Fatigue Life of Austenitic Stainless Steels,* G. Fargas, M. Anglada and A. Mateo, Key Engineering Materials, 2010, Vol 423, pp. 99-104. 5. *Towards the development of high Strength Steels by Replacing Carbon by Nitrogen,* X.C. Xiong, M. Gouné, A. Redjaïmia, Proceedings of International Conf. on High Nitrogen Steels 2006, Sichuan, China, pp. 159-166.