Michael Auinger, J Nanomed Nanotechnol 2014, 5:5
http://dx.doi.org/10.4172/2157-7439.S1.017

OMICS Group Conferences
Accelerating Scientific Discovery

4th International Conference on
Nanotek & Expo

December 01-03, 2014 DoubleTree by Hilton Hotel San Francisco Airport, USA

Nanosized precipitates during subsurface oxidation of steels-Turning a corrosion problem into a mechanism to increase mechanical properties

Michael Auinger
InnovMath, Austria

Steels and nickel-based alloys possess a very broad field of applications, ranging from high temperature materials (e.g. boiler steels or steam turbine blades) to view parts in automotive industry, cutting tools or for special pharmaceutical applications. During manufacture of sheet materials, oxidation is considered as severe problem. Especially during hot-rolling of a sheet, the material suffers from the formation of an outer scale layer (mostly wustite) and the formation of inner oxides, both inside the grains and along grain boundaries. Whereas the scale layer can be easily removed in an industrial process, grain boundary oxides weaken the cohesion between individual grains, which may ultimately fall off during forming of the final workpiece. Grain boundary oxides can only be removed by costly pickling procedures, which remove the first 20 µm of the sheet material. This represents a similar 4% loss of a 1mm thick sheet. Surprisingly, the presence of fine grained inner precipitates has a very beneficial effect of material's hardening. The formation of small nitride particles (100nm or less) in the alloy microstructure builds a transition in hardness between the hard outer shell of iron nitrides and the soft interior of the material. Without this transition zone, the hard shell may easily break (egg-shell effect). This presentation aims to distinguish the influence of inner precipitates on the mechanical properties of a material and provides strategies to decrease the amount of brittle grain boundary oxides to finally turn the unavoidable oxidation problem from manufacture into enhanced mechanical properties of the material.

Biography

Michael Auinger studied Chemical Engineering at the Johannes Kepler University (Linz, Austria) and obtained his doctorate degree in the field of Superconductors under the supervision of Prof. Gritzner in 2009. Later, he joined the Max-Planck-Institut für Eisenforschung GmbH in Duesseldorf (Germany) and started to work on High Temperature Corrosion, Hydrogen Storage and Electrochemical Corrosion of steels. Since 2014, he works as a self-employed research consultant for Theoretical Chemistry at InnovMath (Austria). He contributed to 20 international publications and gave 22 scientific talks (9 invited). Apart from research, he is a member of the local fire brigade and passionate about diving.

michael.auinger.at@ieee.org