

MS46 O3

Evolution of Texture Structure During Deformation of FCC austenite in Single phase and FCC and BCC duplex Stainless Steels Ping Liu^a, Xiaou Yi^b ^aR & D Centre, Sandvik Materials Technology, Sandviken Sweden. ^bStockholm University, Stockholm, Sweden. E-mail: ping.liu@sandvik.com

Keywords: Texture, X-ray diffraction, X-ray diffraction

Stainless steels are in most cases polycrystalline. Texture structure often occurs in this type of materials due to thermo-mechanical processes, which can be desirable or undesirable [1].

Both the FCC austenitic stainless steel and the duplex stainless steel, which consists of 50-50 FCC austenite and BCC ferrite, were heat treated at 1100 °C for 10 min and then deformed at 61 % and 35 % strains respectively. The texture structures were measured using X-ray powder diffraction with radiation of Cr k_{α} as recrystallization and deformation texture respectively.

The results showed that the texture structure was different after recrystallization for the single FCC austenite sample and the FCC-BCC duplex sample. The texture structures after deformation differed even more. This implies that the deformation mechanism for the FCC austenite is different when the second phase, such as BCC ferrite is present. The texture structures of BCC ferrite in the duplex sample was found to deviate from the recrystallization one to the cold deformation one as it expected [2].

The texture structures were analyzed using orientation distribution function (ODF). The detailed analysis will be presented at the conference.

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MS46 O4

Microstructure and defects of preferentially oriented platinum nanoparticles Emmanuel Garnier^a, Matteo Leoni^b, José Solla-Gullon^c, Frédéric Pailloux^d, Enrique Herrero^c, S. Brimaud^a. ^aLaboratoire de Catalyse en Chimie Organique, UMR 6503 CNRS, Université de Poitiers, Equipe Electrocatalyse, Poitiers, France. ^bUniversity of Trento, Department of Materials Engineering and Industrial Technologies, Trento, Italy. ^cInstituto de Electroquímica, Universidad de Alicante, Alicante, Spain. ^dLaboratoire de Métallurgie Physique, UMR6630 CNRS, Université de Poitiers, SP2MI, Futuroscope Chasseneuil, France. E-mail: Emmanuel.Garnier@univ-poitiers.fr

Keywords: Pt nanocrystallites, whole powder pattern modelling, surface structure

Nanoscaled Pt-based materials are widely studied because of their applications as catalysts, in particular in fuel cells. The surface structure plays a key role in determining the reactivity of those systems. Fundamental interest to study the mechanisms of model reactions controlled by "size effects" in electrocatalysis has driven research toward the development of synthesis routes that allow a fine tuning

of shape, mean size and size distribution of the produced nanoparticles. For instance it has been already shown that capping by polyacrylate allows cubes and tetrahedr, to be produced [1]. There is a limited number of ways to control the surface of the nanoparticles: among them, electrosorption is a powerful technique able to check the "extended" domains of (100) or (111) symmetry [4].

Here, 2-4 nm Pt nanostructures were produced by the water-in-oil [1,2] and by the polyol [5] methods. An efficient dispersion of the active metal on the support was obtained, but the electrochemical activity of these materials could be annihilated by the adsorption of the stabilizer, in some cases too strongly attached at the surface of the particles (i.e. poly vinyl pyrrolidone). With the colloidal method and H₂ as reducing agent of the Pt precursors, a remarkable enhancement of the ordered domains (100) and (111) is observed, correlated with grain morphology and defect density. The latter information was obtained both by HRTEM and by powder diffraction. In particular, the Whole Powder Pattern Modelling (WPPM) [2,3] was employed to extract a domain size distribution and information on lattice defects from the diffraction patterns.

The results demonstrate that surface and size control can provide a viable route to tailor the activity and stability of platinum nanoparticle catalysts.

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MS46 O5

Some examples of microstructural analysis of nanosized materials using whole pattern refinement with the Fullprof program S. Péchev, A. Le Nestour, N. Pailhé, M. Gaudon, D. Dambournet, J. Majimel, P. Gravereau, A. Demourgues, *Institut de Chimie de la Matière Condensée de Bordeaux – CNRS, Université Bordeaux I, 87, av. du Dr A. Schweitzer, 33608 Pessac cedex, France.* E-Mail : pechev@icmcb-bordeaux.cnrs.fr

Keywords: microstructure, size effect, anisotropy

The microstructural features of different powder samples were studied by X-ray diffraction as part of more large investigations on the physical-chemical properties of nanosized materials with various applications. So Zn_{1-x}Cu_xAl₂O₄ spinels were studied for their UV-vis-NIR absorption properties [1], α -Fe₂O₃ – as pigment [2] while AlF_{2.5}(OH)_{0.5} attracts attention with a high number and strong Lewis acidity sites [3].

Experiments were carried out on laboratory powder X-ray diffractometers. The informations about the coherent domain size and microstrains were extracted from the line broadening analysis of powder X-ray diagrams using the integral breadths. Williamson-Hall plots were drawn up as first approach to estimate the relative part of each one of the two contributions. They allowed also showing anisotropic size effects in α -Fe₂O₃ and AlF_{2.5}(OH)_{0.5}. Full pattern refinements were performed next for better

analytical description of the identified phenomena. The Fullprof program was used. The peak profiles were fitted by the pseudo-Voigt function of Thompson, Cox and Hastings with Lorentzian and Gaussian contributions being treated separately. The instrumental part of the line broadening was taken into account with a resolution functions (IRF) based on LaB₆ standard. The sample-related refined parameters corresponded to isotropic or anisotropic size and isotropic strains effects.

The X-ray diffraction studies were completed by TEM experiments. They showed particle sizes and shapes in good agreement with the previous XRD estimations.

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