Extraordinary high conductivity in SrTiO3-based oxide heterostructures due to interfacial redox reactions

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Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

[1] For this reason we investigated the photoelectronic properties of TiO2/SnO2 interfaces inside powders quantitatively. In order to obtain TiO2 and SnO2 nanoparticles with narrow size distributions we employed the metal organic chemical vapor deposition method (MOCVS) in a flow reactor system. Structure, morphology (XRD, TEM) and spectroscopic properties (UV-Vis, Electron Paramagnetic Resonance) of the resulting particles were characterized. Solvent-mediated particle aggregation was employed to produce nanoparticle networks containing a high abundance of functional interfaces. For tracking charge transfer processes across heterointerfaces the generation of hole centers as well as the adsorption of small molecules under light exposure were measured with EPR. We experimentally observed that the intentional attachment of vapor-grown SnO2 nanoparticles to TiO2 particle surfaces yields networks of intermixed nanoparticles with substantially improved charge separation properties. [2] [1] Kamat, P. V. et al.; J. Phys. Chem. C, 2008, 112, 18737 [2] Siedl, N. et al.; J.Phys.Chem. C, 2009, 113, 15792.

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17:20 **Extraordinary high conductivity in SrTiO3-based oxide heterostructures due to interfacial redox reactions**

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Resume : The conductance confined at the interface of complex oxide heterostructures provides new opportunities to explore nanoelectronic as well as nanoionic devices. When two oxides intimately contact each other, charge redistribution or mass transfer of ions may occur. Herein we show interfacial redox reaction induced metallic conductivity along the interface of SrTiO3-based heterostructures with various oxide overlayers of amorphous LaAlO3, SrTiO3 (STO) and yttria-stabilized zirconia (YSZ) films. The stability of the interfacial conductivity upon high temperature annealing in oxygen environment and its influence on the ionic conductivity of YSZ/STO heterostructures will be also discussed. 5 10

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17:20 **GRAIN BOUNDARY ENGINNEERING OF CGO BY HETEROGENEOUS COMPOSITION CHANGES**

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Resume : The grain boundary engineering can play an important role on controlling polycrystalline materials properties. This work shows that ceramic samples obtained by adding small additions of cerium oxide or gadolinium oxide to CGO10 powders (i.e. Ce0.9Gd0.1O1.95) retain nearly unchanged bulk properties, while the grain boundary contribution to the overall conductivity is strongly affected by this kind of heterogeneous composition changes. Microstructural contributions of the overall electrical behaviour were de-convoluted by electrochemical impedance spectroscopy, obtained in air between 1000 and 100°C. Additions of excess of Ce and Gd play opposite effects, with major drop in specific grain boundary conductivity on adding Ce, and significant improvement by additions of Gd. Scanning electron microscopy shows that the sintering behaviour is also affected by heterogeneous doping with an increase of the grain size on adding Ce, and grain growth inhibition with addition of Gd. These results may be ascribed to a combination of increase in space charge potential in the presence of Ce-rich shells, enhancement of grain growth and related diffusion controlled processes occurring at grain boundaries. Reverse effects were found on additing Gd. Significant changes in space charge layer thickness also suggest that retained heterogeneities play a significant role on grain boundary behaviour. This may be a very simple and useful approach to obtain ceria-based solid electrolytes with improved properties. 5 11

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17:20 **Investigation of the Electronic Partial Conductivity in the Interfaces of Nanoscaled Oxide Multilayers**

Authors : Halit Aydin [1], PD Dr. Carsten Korte [2], Prof. Dr. Jürgen Janek [1]

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Resume : Interfaces between crystalline solids show very different properties compared to the bulk. Ionic transport parallel to boundaries is often strongly enhanced. Transport phenomena in boundaries are still less 5 12