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ELECTRODEPOSITION IN THE ORGANIC SOLVENT OF MICROCRYSTALLINE Ag-Ni ALLOYS

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Ag-Ni/Cu alloys grown by electrodeposition in the organic solvent was been investigated. Know that phase diagram of Ag-Ni system is sample eutectic type with very small (<1wt%) mutual solubility and absence of intermediate compounds [1]. In our electrodeposition experiments single phase of solid solution Ag-Ni film alloys with any given compounds (10wt%Ag-90wt%Ni, 40wt%Ag-60wt%Ni, 70wt%Ag-30wt%Ni) are grown. Variations of alloy structure are possible by change of salts concentration in the solution and voltage between electrodes. Grain size was been determinate from broad of the x-ray diffraction pikes. For the different compounds the grain sizes are different (with 40-50 Å for alloys near 1:1 compound).
Both Ag and Ni have bcc structures with very different parameters (15% difference). Unit cell parameters for intermediate alloys have volumes between unit cell parameters of the pour elements. Prepared mechanically alloying Ag50Ni50 is nanostructure of pour (Ag and Ni) elements [2]. Our electrodeposition Ag-Ni alloys produced the solid solution Ag-Ni alloys. We assume that growth of solid solutions compounds in Ag-Ni system by electrodeposition method is possible due the low (room) grown temperature.
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POLYMER-ASSISTED FORMATION OF POLYOXOMOLYBDATES

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In the presence of PEO-containing tri-block copolymer gels or semi-dilute/concentrated PEO (polyethylene oxide) homo-polymer solutions, the slow decomposition of an unstable precursor compound, $MoO_2(OH)(OOH)$, could yield polyoxomolybdates with highly ordered network structures. Synchrotron small angle X-ray scattering (SAXS) and wide angle X-ray diffraction (WAXD) could show that crystals of polyoxomomolybdate formed a highly porous primitive cubic network, similar to that of certain zeolites, but with lattice constants of the order of 5 nm. Scanning and transmission electron microscopy measurements revealed single crystals with overall sizes in the micron length scales.
The decomposition of $MoO_2(OH)(OOH)$ has also been carried out in a micellar solution of tri-block copolymers. The nanoscale modification on the formation of polyoxomolybdates was monitored by laser light scattering. The results could suggest the formation of uniform but probably hollow 'nanospheres' that are precursors to the formation of long-range ordered structures.
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SCANNING-SAXS: A TOOL FOR STRUCTURAL CHARACTERIZATION OF COMPLEX MATERIALS AT THE MICROMETER AND THE NANOMETER SCALE

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Many complex materials providing optimized mechanical properties are hierarchically structured, often down to the atomic or molecular level. Typical examples are biological tissues, such as bone and wood, but also many advanced technological composites. Structural investigations of such materials require new experimental techniques with the proper position resolution. Besides electron microscopy, a very promising attempt is the movement (scanning) of a thin specimen trough a narrow x-ray beam, collecting a two-dimensional (2d) SAXS pattern for every scanning step. Hence, such scanning experiments provide simultaneously information on two different length-scales, i.e. At the micrometer scale (e.g., a transmission-image with a spatial resolution defined by the size of the beam) and at the nanometer scale (a 2d SAXS pattern for every scanning step). While laboratory x-ray sources with pinhole geometry permit a position resolution down to about 100 microns, the high brilliance of synchrotron radiation sources opens the possibility to reduce the beam size to about one micrometer or even below, using special focusing techniques. Thus, an imaging of the structure of materials at the nanometer scale with a position resolution reaching that of a light-microscope has become feasible with scanning-SAXS using synchrotron radiation. The present contribution will demonstrate the application potential of this new technique on the basis of recent experimental studies of different complex materials. In particular we will discuss the complementary information, which can be gained from different levels of hierarchical organization for the example of nanometer sized mineral particles in bone and mineralized tendon.

Keywords: SCANNING SAXS COMPOSITES BONE

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APPLICATIONS OF MULTIPLE SMALL-ANGLE NEUTRON SCATTERING

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Various authors have recognized the power of multiple small-angle neutron scattering (MSANS) analysis in providing information on coarse, concentrated microstructures involving micrometer length-scales larger than those accessible in conventional SANS studies [1-5]. When complemented by single-scatter SANS (for Porod surface-area determination), and sometimes by ultrasmall-angle x-ray scattering, MSANS studies have added significantly to our understanding of processes such as sintering in ceramics [1-3]. Together, these methods can provide statistically representative microstructure information over the scale range from one nanometer up to about four micrometers. Following earlier work that considered the case of spherical scatterers [1,2] and, later, randomly oriented spheroidal scatterers [3], the MSANS analysis has been extended to include non-randomly-oriented spheroids [4,5]. The extended MSANS analysis has been applied in studies of the multi-component void morphologies encountered in ceramic and metallic thermal barrier coating materials of technological interest. Insights have been gained into the changes observed for each anisotropic void component in response, for example, to varied processing and thermal cycling. Some previously unrecognized 'universal-type' behaviors have been identified.
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