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Keynote Forum

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Significance of Carbon Nanostructures towards Multifaceted Applications

Carbonaceous materials have gained the attention of global scientific community to address multifaceted applications. Owning to their astonishing properties, all in one approach have been executed to explore the application of these carbonaceous materials. Energy, environment & healthcare are the utmost important areas of concern for sustainable human development. Therefore, these materials have been deliberately designed & developed to serve the purpose extensively. Furthermore, they have been characterized by using various sophisticated analytical techniques such as near edge X-ray adsorption spectroscopy (NEXAS), 13C solid state Nuclear Magnetic Resonance(NMR), High Resolution X-ray Photoelectron Spectroscopy (XPS), High Resolution – Transmission Electron Microscopy (TEM), Selected Area Electron Diffraction (SAED), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Atomic Free Microscopy (AFM), Raman, Thermogravimetry-differential thermal analysis (TG-DTA), Fourier-transform infrared spectroscopy (FTIR), Ultraviolet-Visible Spectrophotometer (UV-Vis) etc. Structural confirmation & electrochemical exploration have ascertained their potential towards energy storage and conversion devices. Thermal stability, antimicrobial activity & cytocompatibility studies have certified their suitability for biological applications. Hence, herein, the methods for design & development of such materials for multifaceted applications have been extensively studied with special emphases on their relevant application.

Biography

Shrikant S Maktedar is an Assistant Professor at Dept. of Chemistry, National Institute of Technology, Srinagar, J&K, India. He received B.Sc. Degree in Chemistry from Ramkrishna Paramhansa Mahavidalaya, Osmanabad (Dr. Babasaheb Ambedkar Marathwada University, Aurangabad) in 2008 and M.Sc. Degree in Physical Chemistry from Dept. of Chemistry, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad in 2010. He has completed his Ph.D. from Central University of Gujarat, Gandhinagar, India. In last 10 years he is working in the field of carbonaceous materials with emphasis on their multifunctional applications. Dr. Shrikant has published more than 10 research publications in peer-reviewed international journals of repute, one book chapter and two full length conference papers. He has served as reviewer for few international journals of repute. After his joining to NIT Srinagar he is serving as Ph.D. supervisor and has established Materials Research Laboratory at Dept. of Chemistry.

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Crystallographic Analysis of Thermoelasticity and Superelasticity in Shape Memory Alloys

Shape memory effect is a temperature dependent phenomenon exhibited by certain alloy systems called shape memory alloys which take place in the class of advanced smart and functional materials, by exhibiting thermoelasticity and superelasticity. Thermoelasticity is initiated by thermomechanical treatments on cooling and deformation and performed thermally on heating and cooling. Superelasticity is performed mechanically by stressing in parent phase field. In the shape memory effect, the material is deformed plastically in low temperature condition; strain energy is stored in material and released on heating by recovering the original shape. Also, the materials cycle between original and deformed shapes on heating and cooling in the bulk level. Thermoelasticity is governed by thermal and mechanical reactions, thermal and stress induced martensitic transformations on cooling and stressing, and performed thermally on heating and cooling after first cooling and stressing processes. Superelasticity is governed by stress induced transformation by stressing and releasing materials at a constant temperature in parent phase region.

Thermal induced martensite occurs on cooling with the cooperative movements of atoms $\langle 110 \rangle$-type directions on the $\{110\}$-type plane of austenite matrix, along with lattice twinning and ordered parent phase structures turn into twinned martensite structures. The twinned structures turn into detwinned martensitic structures with deformation by means of stress induced transformation. Lattice Twinning occurs in two opposite directions, $\langle 110 \rangle$-type directions on the $\{110\}$-type plane of austenite matrix in self-accommodating manner and consists of lattice twins. The twinning occurs with internal stresses, while detwinning occurs with the external stresses. Twinning and detwinning processes can be considered as elementary processes activated during the transformations. Temperature has great importance in the thermomechanical behavior of shape memory alloys. Shape memory effect is performed in a temperature interval after first cooling and stressing processes, whereas superelasticity is performed mechanically in a constant temperature in parent phase region, just over the austenite finish temperature. Stress-strain profile is not linear in superelasticity, stressing path and releasing path are different, and hysteresis loop refers to the energy dissipation. Deformation at different temperature exhibits different behavior beyond shape memory effect and superelasticity.

Copper based alloys exhibit this property in metastable beta-phase region, which has bcc based structures at the parent phase field. Lattice invariant shear and twinning is not uniform in these alloys and cause the formation of complex layered structures, depending on the stacking sequences on the close-packed planes of the ordered lattice.

In the present contribution; x-ray and electron diffraction studies were carried out on two solution treated copper based CuZnAl and CuAlMn alloys. Electron and x-ray diffraction exhibit super lattice reflections. Specimens of these alloys were aged at room temperature, at which both alloys are in martensitic state. A series of x-ray diffractions were taken at different stages of aging in a long-term interval. X-Ray diffraction profiles taken from the aged specimens in martensitic conditions reveal that crystal structures of alloys chance in diffusive manner, and this result refers to the stabilization.

Biography

Osman Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has been retired due to the age limit of 67, following academic life of 45 years.

He published over 80 papers in international and national journals; He joined over 100 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/ co-chair in some of these activities. In particular, he joined in last seven years (2014 - 2020) over 80 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. He supervised 5 PhD- theses and 3 MSc- theses.

Dr. Osman Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

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