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P.120	**The preparation and characterisation of P-type $Na_xCo_2O_4$-based thermoelectric ceramics for energy generation from waste heat**
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A large amount of energy is wasted as unused heat whenever fossil fuels are burnt, such as in coal power plants and internal combustion engines in automobiles. Due to diminishing fossil fuel reserves, thermoelectric materials are becoming increasingly important as alternative power sources. Thermoelectric devices consisting of both p-type and n-type semiconductor components can be used to scavenge energy from waste heat and convert it into useful electricity. Currently the highest performing thermoelectric materials are based on metallic semiconducting alloys, such as n-type Bismuth Telluride. However these are unstable at temperatures experienced in environments such as found in automobile exhausts, therefore research has intensified in the metal oxide thermoelectric materials based on the sodium ($Na_xCo_2O_4$) and calcium ($Ca_3Co_4O_9$) cobaltites.

$Na_{0.5}Co_2O_4$-based materials with Copper substitutions have been prepared using the standard mixed oxide route, including the use of high energy milling, high pressure sintering and Spark Plasma Sintering (SPS). For laboratory processing, the powders were calcined at 830°C for 24hours, and then sintered at 830°C for 12hours under a pressure 180kPa. The use of SPS yields significantly higher density and products with superior thermoelectric properties. The families of materials have been characterised by XRD, SEM, and in terms of thermal conductivity, electrical resistivity and Seebeck coefficients. Both high pressure and SPS methods produced high density samples with oriented grain structure. The effect of processing method on the microstructure and thermoelectric properties will be discussed.

P.121	**Relation between structural and thermoelectric properties in chemically stable Na_xCoO_2 thin films**
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Direct conversion of waste heat into electrical energy by thermoelectric modules offers tremendous potential for reducing the overall energy consumption. The efficiency of these devices can be improved by designing “phonon-glass/electron-crystal” materials, which have a high thermopower and electrical conductivity combined with a low thermal conductivity.

Single crystals of Na_xCoO_2 show very promising thermoelectric properties, however overall performance is limited by a high lattice thermal conductivity. It is expected that this can be improved in Na_xCoO_2 thin films, due to enhanced phonon scattering. The growth of these thin films is reported, however thermoelectric characterization is very challenging because of chemical instability in air.

We present a method to obtain single-phase Na_xCoO_2 thin films by pulsed laser deposition, which are chemically stable in air. Chemical stability of these films is now achieved by the in-situ deposition of an amorphous AlO_x capping layer, which prevents reaction of the thin film with moisture and CO_2 from air. No degradation of the structural and electrical transport properties of these capped thin films is observed for several months.

Subsequently we report a detailed growth study, which results in control over the structural properties of these stable Na_xCoO_2 thin films. We show that layer thickness, deposition parameters and substrate material can be used to tune the crystalline properties of the thin films. In relation to these structural changes we studied the electrical transport properties and thermopower, demonstrating significantly enhanced thermoelectric potential of these stable Na_xCoO_2 thin films.

P.122	**Transparent ZnO films on a glass substrate prepared by low-temperature hydrothermal growth** Slavko Bernik[1,2], Matejka Podlogar[1,2], Jacob J. Richardson[3], Damjan Vengust[1], Nina Daneu[1,2], Aleksander Recnik[1,2] [1]Department for Nanostructured Materials, Jozef Stefan Institute, Ljubljana, Slovenia, 1000; [2]RRP2, Center of Excellence Namaste, Ljubljana, Slovenia, 1000; [3]Materials Department, University of California Santa Barbara, USA, CA 93106

The applications of transparent-conductive thin films (TCFs) in the technologies of flat-screen displays, touch screens and solar cells are critically dominated by indium tin oxide (ITO). The boom in these applications, the limited resources of indium and consequently its high price emphasize the strong need for the development of cheaper alternatives. ZnO-films are good candidate to replace ITO films. They can be deposited onto substrates by different solid-vapour-based techniques. However, in recent years solution-based synthesis methods are being increasingly developed because of the advantages in cost, easier transformation to large-scale production and the reduced pollution effects.
Transparent and conductive ZnO films on glass substrate were prepared using low-temperature hydrothermal synthesis at 90°C from aqueous solutions of Zn-nitrate and Na-citrate. In the first and second step ZnO seed layer on glass with the proper thickness, size, connectivity and orientation of seed grains has to be prepared to enable the nucleation and growth of smooth and dense (0001) oriented ZnO films from the solution in the third step. Films with a thickness of about 8 μm had optical transparency in the visible range of the spectrum of about 80% and a relatively low sheet resistance for undoped ZnO of the order of 80 Ωcm. The preparation of the ZnO seed layer on glass and its influence on the growth of the highly (0001) textured polycrystalline ZnO film under spatially confined oriented growth (SCOG) mechanism will be discussed.

P.123	**Investigation of Co-doped PZT films deposited by rf-magnetron sputtering** Felicia Gheorghiu[1], Radu Apetrei[1], Marius Dobromir[1], Adelina Ianculescu[2], Dumitru Luca[1], Liliana Mitoseriu[1] [1]Department of Physics, "Alexandru Ioan Cuza" University, Iasi, Romania, 700506; [2]Department of Oxide Materials Science and Engineering, Polytechnics University of Bucharest, Romania, 011061

In the last years, there is a great interest in preparation and investigation of different types of ferroelectric thin films for device fabrication due to the technological applications, such as: piezoelectric devices, non-volatile random access memory devices, surface acoustic wave filters (SAW), micro-electromechanical systems (MEMs) and nano-electromechanical systems (NEMs) applications.
The focus of the present paper is to describe the preparation procedure and to investigate the microstructural characteristics and the electrical properties of Co-doped PZT films deposited by rf-sputtering by using a “mixture” target system onto Au-electroded Al_2O_3 ceramic substrates. The X-ray diffraction patterns of the Co-doped PZT thin films as a function of the annealing temperature confirmed the formation of pure perovskite phase started with temperatures of 600°C, but a perfect crystallization was