of different superconducting properties and their anisotropic behaviour are related to crystal composition, lattice parameters and changes of lattice site occupancies of the composing elements.

TT 23.2 Mo 14:00 Poster TU D

In-situ synthesis of MgB_2 thin films for tunnel junctions — •R. Schneider, J. Geerk, F. Ratzel, A.G. Zaitsev, R. Heid, and K.-P. Bohnen — Forschungszentrum Karlsruhe, Institut für Festkörperphysik, P.O.B. 3640, D-76021 Karlsruhe

A novel approach to the in-situ preparation of as-grown MgB_2 thin films is presented. It comprises a conventional B sputter gun and a special Mg evaporator that provides a high Mg vapor pressure at the position of the substrate. Thin films deposited on r-plane sapphire substrates at a temperature of 440°C had a zero resistance T_c of 33 K and a residual resistivity of approximately 100 $\mu\Omega$cm. Sandwichtype tunnel junctions with a natural MgB_2 oxide as the potential barrier were prepared for superconducting tunneling spectroscopy. Conductance measurements up to 500 mV revealed estimates of the barrier thickness of 1.5 nm and height of 1.6 eV. The slowly varying conductance between ±100 mV allowed us to determine the tunneling density of states. The inversion of the tunnel data using the standard single-band Eliashberg equations yielded an effective electron-phonon spectral function accounting for the smaller energy gap. The features of the tunneling spectrum were analyzed by ab-initio LDA calculations and the two-band Eliashberg equations.

TT 23.3 Mo 14:00 Poster TU D

Laserablatierte Magnesium / Bor Multilagen in Kombination mit in-situ Temperschritten: eine Methode zur Herstellung von MgB_2-Schichten — •Andreas Klimmer[1], Roland Steiner[1], Alfred Plettl[1], Paul Ziemann[1], Jun Cai[2] und Jürgen Behm[2] — [1]Abt. Festkörperphysik, Universität Ulm — [2]Abt. Oberflächenchemie und Katalyse, Universität Ulm

Es wurden unter UHV-Bedingungen dünne Multilagen aus Magnesium und Bor bei Raumtemperatur mit Hilfe eines 193 nm - Excimer-Lasers bei hohen Energiedichten auf c-Saphir abgeschieden. Dabei wurden die Schichtdicken so eingestellt, dass sowohl nominell stöchiometrisches als auch Mg-reiches MgB_2 resultieren sollte. Als abschließende Deckschichten wurden dicke Mg-B- bzw. reine B-Schichten verwendet. Ein anschließender in-situ Temperschritt mittels eines CO_2-Lasers ermöglicht in den bereits bei der Ablation durchmischten Schichten eine Reaktion zu MgB_2. Temperatur und Dauer des Temperschritts wurden systematisch variiert und die resultierende Probenzusammensetzung und Struktur mittels Röntgen-, RBS- und XPS-Tiefenprofilmessungen bestimmt. Die Charakterisierung der supraleitenden Eigenschaften erfolgte durch Magnetisierungs- bzw. Transportmessungen.

Erste Ergebnisse liefern Schichten mit einer maximalen Sprungtemperatur von 23,8 K. Dieser, im Vergleich zum Maximalwert von 39 K reduzierte Wert wird auf Mg-Verluste während des Temperns und relativ hohe C-Verunreinigungen aus dem benützten B-Target zurückgeführt.

TT 23.4 Mo 14:00 Poster TU D

Preparation and Characterization of thin Superconducting MgB_2 Films — •A. Sidorenko[1,2], V.I. Zdravkov[2], E. Nold[3], Th. Koch[4], and Th. Schimmel[1,4] — [1]Institute of Applied Physics, Universität Karlsruhe, D-76128 Karlsruhe — [2]Institute of Applied Physics, MD-2028 Kishinev, Moldova — [3]Institute of Materials Research I, Forschungszentrum Karlsruhe, D-76021 Karlsruhe — [4]Institute of Nanotechnology, Forschungszentrum Karlsruhe, D-76021 Karlsruhe

Superconducting MgB2 films with a critical temperature, Tc , up to 39.3 K were prepared in a new way by DC-magnetron sputtering from a composite target containing MgB2 and metallic Mg in approximately equal amounts and ex-situ annealing in Mg vapour using an especially designed Nb reactor. The AFM imaging show a very smooth and homogeneous morphology of the film surfaces which were deposited with this method on (100) - sapphire substrates. Depth profile scanning auger analysis of the thin MgB2 layers detected the presence of oxygen in only small regions of 10 nm thickness near the surface of the film and near the interface between the substrate and the MgB2 layer. The parameters of the MgB2 films which influence Tc, are discussed.

TT 23.5 Mo 14:00 Poster TU D

Mn substitution in MgB_2 single crystals: influence on structural properties — •G. Schuck, N.D. Zhigadlo, S.M. Kazakov, K. Rogacki, and J. Karpinski — Solid State Physics Laboratory ETH-Hönggerberg, CH-8093 Zürich, Switzerland.

Superconducting single crystals of Mn-doped MgB_2 phase have been grown at a pressure of 30 kbar using cubic anvil technique. Critical temperature versus Mn content dependence of single crystals shows different behavior from that of polycrystalline samples [1], because even small substitution of 1.5% of Mn decreases T_c by about 15K. The lattice constant a remains almost unchanged while the c parameter slightly decreases with Mn content. Single crystal X-ray and EDX investigations show the existence of single phase crystals up to 2% Mn substitution. For crystals with higher Mn content we present single crystal determination in order to get information on what crystallographic position Mn is substituted in the MgB_2 crystal structure.

[1] S. Xu, Y. Moritomo, K. Kato and A. Nakamura, J. Phys. Soc. Japan, 70 (2001) 1889-1891

TT 23.6 Mo 14:00 Poster TU D

Influence of the stoichiometry variations on the properties of MgB_2 prepared by mechanical alloying — •Marko Herrmann, Olaf Perner, Wolfgang Hässler, Christian Rodig, and Bernhard Holzapfel — Institut für Festkörper- und Werkstoffforschung (IFW) Dresden

MgB_2 powder was prepared by mechanical alloying of Mg and amorphous boron powder which gives a partially reacted nanosized precursor powder with a high reactivity. For studying the influence of the stoichiometry the Mg/B-ratio was variied in the range of 0.8 to 1.2. Furthermore different boron qualities were used. These precursor powders were hot pressed to bulk samples and were used for the preparation of tapes with an iron sheath. The structural and superconducting properties of bulk samples and tapes are described in detail. The samples with a Mg/B-ratio>1 show the highest critical temperature (36K) and the best current density (40 kA/cm^2 at 4.2K and 7.5T).

TT 23.7 Mo 14:00 Poster TU D

Magnetron sputtering of TiN thin films for superconducting single-photon detector — •Konstantin Ilin[1], Michael Siegel[1], Alexei Semenov[2], Heinz-Wilhelm Hübers[2], Eugen Hollmann[3], and Andreas Engel[4] — [1]Institut für Mikro- und Nanoelectronische Systeme, Universität Karlsruhe — [2]DLR Institut für Planetenforschung, Berlin — [3]Forschungszentrum Jülich GmbH, Jülich — [4]Physik-Institut der Universität Zürich

Thin and especially ultra-thin superconducting films are widely used for the development of modern radiation sensors, e.g. direct detectors and mixers, providing ultimate performance in a wide range of the electromagnetic spectrum. Recently proposed single-photon detector also utilize ultra-thin films. In order to shift the cut-off wavelength of these devices to infrared and far-infrared spectral range, a superconducting material with a small value of the energy gap and an ability to form superconducting thin films is required. In this report we present our results on the development of the growing technology of thin titanium nitride films. The TiN thin films were deposited on sapphire substrate by dc magnetron sputtering of Ti target in Ar+N_2 atmosphere. The substrates were heated up to 850°C. The superconducting transition temperature of about 5 K has been obtained for 30-nm thick films. We will discuss the dependencies of the film composition, transition temperature, and residual resistivity on the deposition regime.

TT 23.8 Mo 14:00 Poster TU D

Synthesis and Characterization of new $Re_xW_{1-x}O_3$ Phases — •Ch. Helbig[1], B. Rohrmoser[1], K. Tröster[1], D. Shorokhov[1], G. Heymann[2], G. Eickerling[1], R. Herrmann[1], E.-W. Scheidt[1], and W. Scherer[1] — [1]CPM, Universität Augsburg, 86135 Augsburg, Germany — [2]Department Chemie, LMU, 81377 München, Germany

In this presentation we outline new synthetic routes to the small class of vacancy perovskites $M_{1-x}M'_xO_3$ (M, M′ = transition metal) which allows to control their physical properties by variation of the ratio of the metal cations. Employing highly topotactical *Chimie Douce* methods [1] or alternatively high pressure/high temperature routes [2] we were able to synthesize mixed WO_3 and ReO_3 phases and characterize them with respect to their crystal chemistry and physical properties. The chosen parent compounds strongly differ in their electronic and structural behavior.The d^1-system ReO_3 has metallic character and cubic symmetry ($Pm\bar{3}m$), whereas the d^0-system WO_3 is an insulator and displays various structural phase transitions between 1170 K and 230 K. However, the structures of all these WO_3 phases can be derived by group-subgroup relationships from the ReO_3 structure [3]. For $Re_xW_{1-x}O_3$ ($x = 0.25$) a metal to semiconductor transition was predicted in the literature [2].