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Influence of aluminium substitution on the heat transport in single crystalline MgB_2 — •A.V. Sologubenko[1,2], N.D. Zhigadlo[2], S. M. Kazakov[2], J. Karpinski[2], and H.R. Ott[2] — [1]II. Physikalisches Institut, University of Cologne, 50937 Cologne, Germany — [2]Laboratorium für Festkörperphysik, ETH Hönggerberg, CH-8093 Zürich, Switzerland

We report data on the thermal conductivity $\kappa(T,H)$ of single-crystalline superconducting $Mg_{1-y}Al_yB_2$ ($y = 0.02, 0.07$) in the normal and mixed states at temperatures between 0.5 and 50 K, and in external magnetic fields H up to 50 kOe. The results are analyzed in terms of a combined phononic (κ_{ph}) and quasiparticle (κ_e) heat transport and compared with our earlier results on pure and carbon-doped MgB_2. The substitution of Al for Mg leads to a considerable reduction of the field-induced κ_e, while κ_{ph} seems to be much less sensitive to impurities. The analysis of the $\kappa_e(H)$ data leads to the conclusion that the introduction of aluminium results in comparable enhancement of the intraband scattering in both the σ- and the π-band. This is in contrast to the carbon substitution for boron, which enhances mostly the intraband scattering in the σ-band. The interband scattering is rather weak in both cases.

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Microwave properties of MgB_2 thin films prepared in situ by thermal evaporation combined with sputtering — •Rudolf Schneider, Alexander G. Zaitsev, Roland Hott, Fritz Ratzel, and Jochen Geerk — Forschungszentrum Karlsruhe, Institut für Festkörperphysik, P.O.B. 3640, D-76021 Karlsruhe, Germany

Superconducting MgB_2 thin films were prepared *in situ* using a combination of rf magnetron sputtering of B and thermal evaporation of Mg. The films exhibited T_c of up to 36 K. Microwave measurements were performed on 14×14 mm^2 films using both Cu-shielded and Nb-shielded sapphire puck resonators at the frequency of 18.8 GHz. The hf surface resistance (R_s) and the change of the hf surface reactance (ΔX_s) were determined. The films exhibited low R_s matching the literature results for high-quality MgB_2 films. Below 3 K R_s reached 3-5 $\mu\Omega$ which was the resolution limit of our measurement. The temperature dependence of both R_s and ΔX_s were in good agreement with BCS theory. From the R_s(T) dependence we obtained an energy gap $\Delta(0)\approx$ 3 meV. The measured variation of the London penetration depth with temperature, $\Delta\lambda_L$(T), was also in good agreement with the BCS model. Using the BCS relation between the energy gap and the penetration depth we fitted our experimental $\Delta\lambda_L$(T) data and obtained $\lambda_L(0)$ values which ranged for different films from 85 to 100 nm.

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Effect of impurity additions on the superconducting properties of in situ-processed MgB_2 — •Marko Herrmann[1], Margitta Schubert[1], Wolfgang Häßler[1], Bernhard Holzapfel[1], and Ludwig Schultz[1,2] — [1]IFW Dresden, P.O. Box 270116, D-01171 Dresden, Germany — [2]Dresden University of Technology, Department of Physics, Institute for Physics of Solids, D-01062 Dresden, Germany

The MgB_2 powder was prepared by mechanical alloying of Mg, amorphous Boron and the additive. For studying the influence of the additive on the superconducting properties its amount was varied up to 20 m-%. Single elements as carbon as well as compounds like SiC were used as dopants. The result of the milling process was a partially reacted nano-sized precursor powder with a high reactivity which was hot pressed to bulk samples. Starting from the undoped MgB_2 with a critical temperature of 36 K and best current densities of 10 kA/cm^2 at 7.5 K and 4 T, the changes of the superconducting properties with the kind and amount of additive are described in detail.

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TEM cross-section analysis of $La_2Zr_2O_7$ buffer layers for YBCO-coated conductors prepared by chemical solution deposition — •Leopoldo Molina[1], Sebastian Engel[2], Kerstin Knoth[2], Bernhard Holzapfel[2], and Oliver Eibl[1] — [1]Institute of Applied Physics, University of Tuebingen, Auf der Morgenstelle 10, D-72076 Tuebingen, Germany — [2]IFW Dresden, Leibniz Institute for Solid State and Materials Research Dresden, Helmholtzstr. 20, D-01069 Dresden, Germany

Chemical solution deposition is a promising method to fabricate low cost buffer layers for YBCO-coated conductors. In this study we present transmission electron microscopy (TEM) analysis of cross-sectional and plan-view prepared $La_2Zr_2O_7$ buffer layers on biaxially textured Ni-W substrates for YBCO-coated conductors prepared by chemical solution deposition methods. The $La_2Zr_2O_7$ buffer layers were deposited on 100 μm thick Ni-W substrate and were heat treated at 900°C and 1050°C. TEM cross-section samples were prepared by conventional mechanical polishing and ion milling techniques. By means of transmission electron microscopy the grain size, the buffer layer thickness, the void size and void density and the orientation of LZO with respect to the Ni substrate was determined. The Ni-W substrate interface with the $La_2Zr_2O_7$ buffer layer was also investigated. Using two-beam imaging conditions bright-field, dark-field and energy spectroscopic images (ESI) were acquired. Chemical composition determination of the films and substrate was done by energy dispersive X-ray microanalysis (EDX).

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Optimisation of $La_2Zr_2O_7$ buffer layers and CeO_2 cap layers on Ni RABiTS for YBCO coated conductors using chemical solution deposition — •Sebastian Engel, Kerstin Knoth, Thomas Thersleff, Heike Schlörb, Ruben Hühne, Ludwig Schultz, and Bernahrd Holzapfel — IFW Dresden, Helmholtzstr. 20, D-01069 Dresden, Germany

Chemical Solution Deposition (CSD) has been used to prepare biaxially textured cerium oxide cap layers and $La_2Zr_2O_7$ (LZO) buffer layers on Ni RABiTS. For the cerium oxide cap layer, a precursor solution consisting of dissolved Ce(III)-acetate in propionic acid, 2,5-pentandion, and 2-propanol was used. The LZO precursor solution was prepared by dissolving La-, and Zr-2,4-pentanedionates in propionic acid. Both, prepared buffer and cap layers were dip-coated and subsequently heat-treated at various temperatures between T = 900°C and 1100°C under different gas flow conditions. The surface texture quality was analysed with Reflection High Energy Electron Diffraction (RHEED) and Electron Back Scattering Diffraction (EBSD). EBSD maps show nearly 100 % biaxially textured surfaces for the optimised LZO buffer layers and cerium oxide cap layer. Further surface properties were investigated by atomic force microscopy and secondary electron microscopy. 300nm thick $YBa_2Cu_3O_{7-\delta}$ test structures were prepared on this buffer layer system CeO_2 (CSD)/LZO (CSD)/ Ni-5 % W tape by pulsed laser deposition and characterised by resistivity measurements at 77 K in magnetic fields up to 9 T.

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All CSD $YBa_2Cu_3O_{7-\delta}$ coated conductor on cube textured Ni-W substrates — •Kerstin Knoth, Sebastian Engel, Ruben Hühne, Steffen Oswald, Brigitte Schlobach, Steffen Strehle, Ludwig Schultz, and Bernhard Holzapfel — IFW Dresden, P.O. Box 270116, D-01171 Dresden, Germany

Chemical Solution Deposition (CSD) was used as a low cost method to prepare an all CSD $YBa_2Cu_3O_{7-\delta}$ (YBCO) coated conductor having a YBCO/CeO_2/$La_2Zr_2O_7$ (LZO)/Ni-5at%W architecture. The LZO and CeO_2 precursor solutions were prepared using new solution routes, whereas the trifluoroacetate (TFA) process was used for the preparation of the YBCO layer. A highly textured LZO/CeO_2 architecture was obtained on Ni-W after annealing at T_A = 900 °C in a reducing atmosphere. The TFA-YBCO layer was deposited afterwards and annealed at T_A = 780 °C. The characterization of the CSD YBCO coated conductor was done using X-Ray Diffraction (XRD), Reflection High Energy Electron Diffraction (RHEED), SEM, AFM, X-Ray Photoelectron Spectroscopy (XPS) and cross sectional analysis using the Focussed Ion Beam (FIB) technique. The TFA-YBCO(200 nm)/CeO_2(60 nm)/LZO(400 nm)/Ni-W coated conductor showed a T_c of 91.0 K with a ΔT_c of 1.2 K. The critical current density J_c was below 1.0 MA/cm^2 compared to a PLD-YBCO/PLD-CeO_2/LZO(400 nm)/Ni-W test sample (PLD - Pulsed Laser Deposition) with J_c = 1.0 MA/cm^2. Nevertheless, these results are very promising towards the realization of an all CSD YBCO coated conductor.

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Effect of H_2S treatment on the orientation and texture sharpness of MgO buffer layers on highly cube textured Ni-4at.%W tapes as a template for YBCO coated conductors — •Rainer Nast[1], Bernhard Obst[1], Oliver Stadel[2], and Wilfried Goldacker[1] — [1]Forschungszentrum Karlsruhe, Institut für Technische Physik, Postfach 3640, D-76021 Karlsruhe — [2]TU Braunschweig, Institut für Oberflächentechnik (IOT), Bienroder Weg 53, D-38108 Braunschweig