



materials research @ NIMP

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NIMP: basic and technological oriented research in condensed matter physics and materials science

Research area

Solid state physics:

Nano-objects, Surfaces & Interfaces, Electronic Correlations, radiation interactions

Nanostructures and functional materials

- energy applications: **generation, conversion, transport and storage;**
materials and composites for fusion and fission
- information technology: **high frequency electronics, optoelectronics,**
ferroics and multiferroics, magnetic.
- medicine & environmental protection: **bio-compatible and bio functional;**
sensors and catalysts.



NIMP Statistics

Human resources: ~ 270 people with ~ 200 in R&D (+50% PhD), mean age ~ 40 years

Funding (2009-17): ~ 11 M€ /year (~2 % from economic activity)

+ Infrastructure investment: 2007-2017: ~27 M€

Research infrastructure :

- **Bulk production:** SPS, MWS, HPS, MA, (UFC, RFS)
- **Thin films:** evap./dep., PLD, MAPLE, MBE +in situ characterization, CVDs
- **Structural:** TEM, HRTEM, SEM/EBS/EDX, XRD, AFM
- **Optical:** UV-VIS-NIR ellipsometry, NSF, FL, TLD, Raman, FTIR, SNOM, PLM
- **Surface:** LEED, RHEED, AES, QMS, STM, STS, SARPES, XPS, UPS, XPD, ARUPS, MEIS, LEEM-PEEM, SPM
- **Physical properties:** PPMS, MPMS-SQUID, VSM, MCDS, LFA, SBA, Dil, TG/DTA, DSC, various electrical/dielectrical properties measurement systems,
- **Spectroscopy:** ESR, Moessbauer



NATIONAL INSTITUTE OF MATERIALS PHYSICS

INSTITUTUL NATIONAL DE FIZICA MATERIALELOR



HOTMAT @ NIMP **materials for** **extreme conditions**

ARIES WP17 PowerMat Kick-off Meeting, CERN, May 5th, 2017



Equipments: mainly powder metallurgy

Assisted sintering: electric field (SPS)
pressure uni-axial (HPS)
microwave field (MWS)

+ ball milling/mechanical alloying (MA) + ultrafast cooling UFC

+ deposition + annealing + arc&RF melting

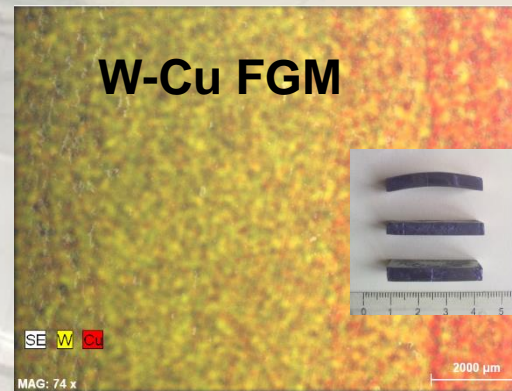
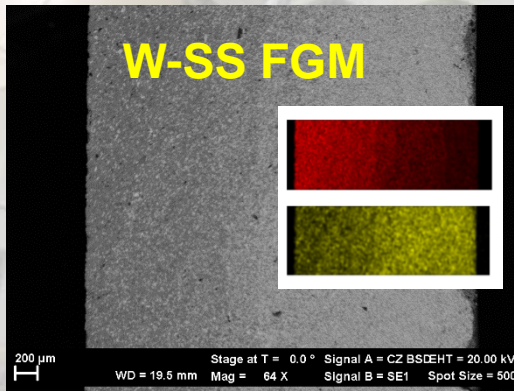
+ single crystal growths (Czochralski 3arc), **LZA**

+ **Analisis (incl. high temperatures!):** XRD, TEM, HRTEM, Moessbauer
DSC, TG-DTA, LFA, SBA, dil
mechanical properties

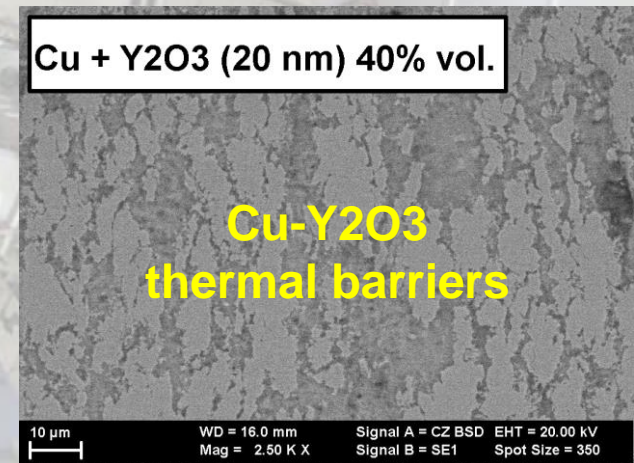
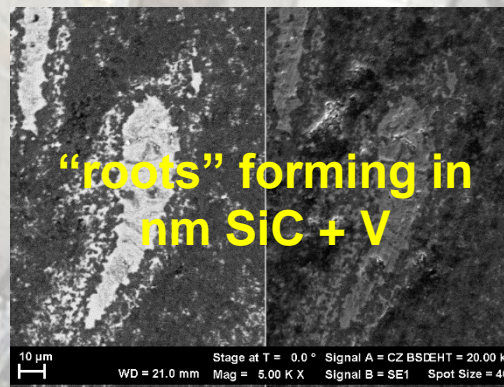
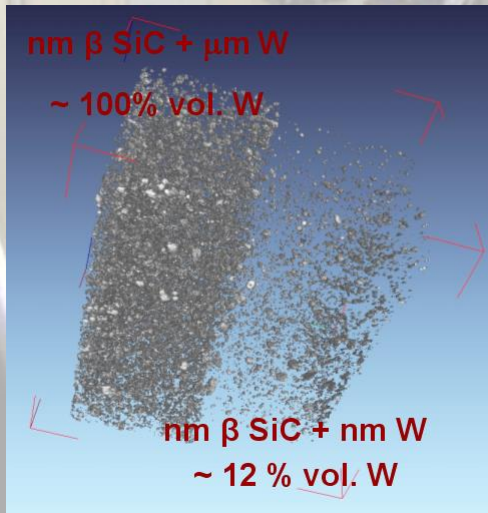
+ **RT analyses:** SEM/EDX, HRTEM, XPS, ...



Typical applications: functionally graded materials

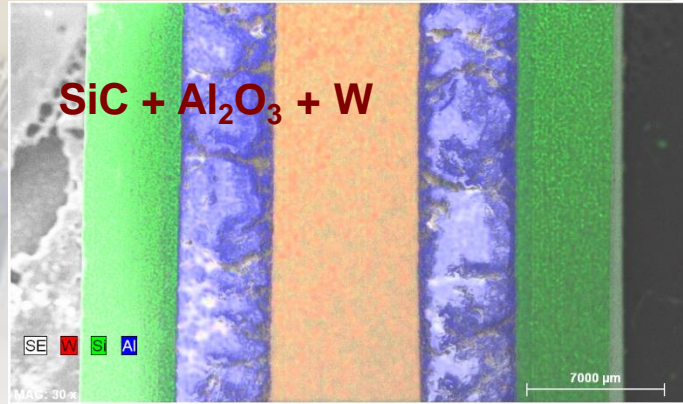
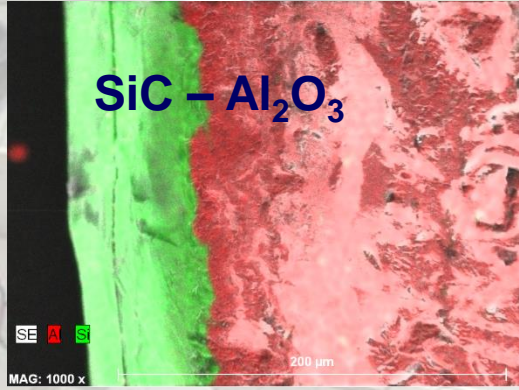
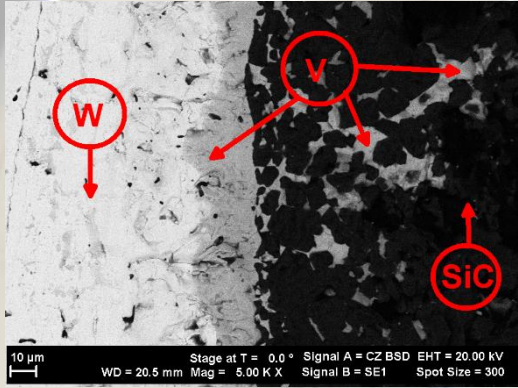


Typical applications: dispersed metal-ceramic composites

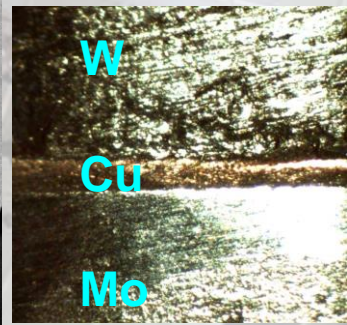
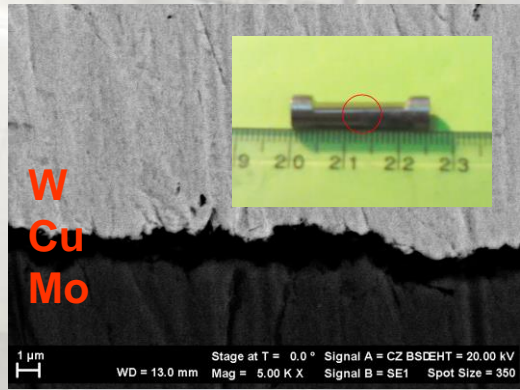
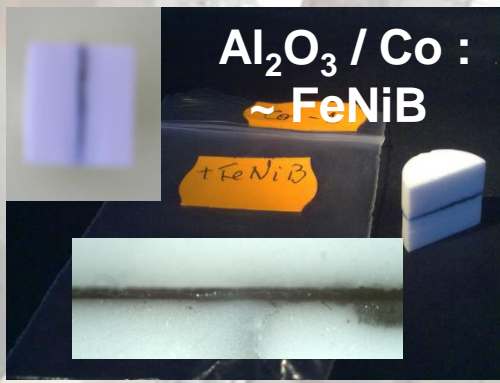




Typical applications: thick coatings with metal and ceramics

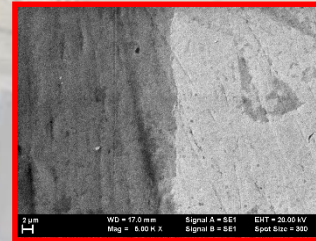
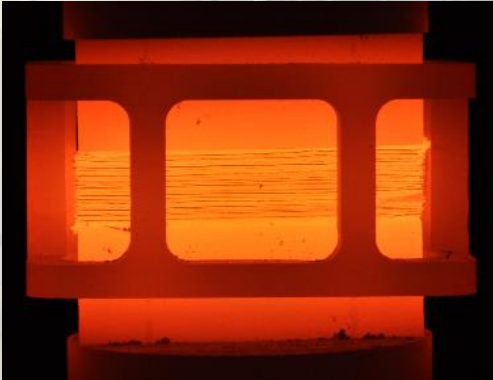


Typical applications: joining refractory materials





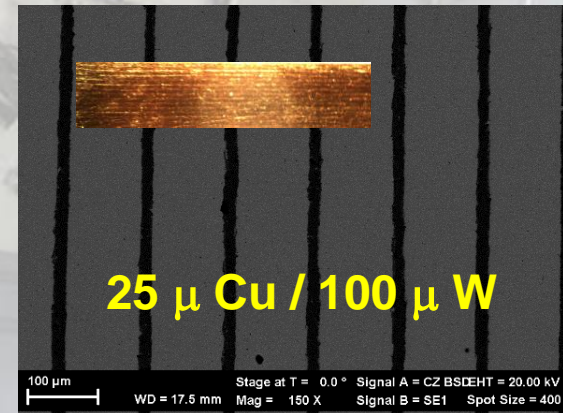
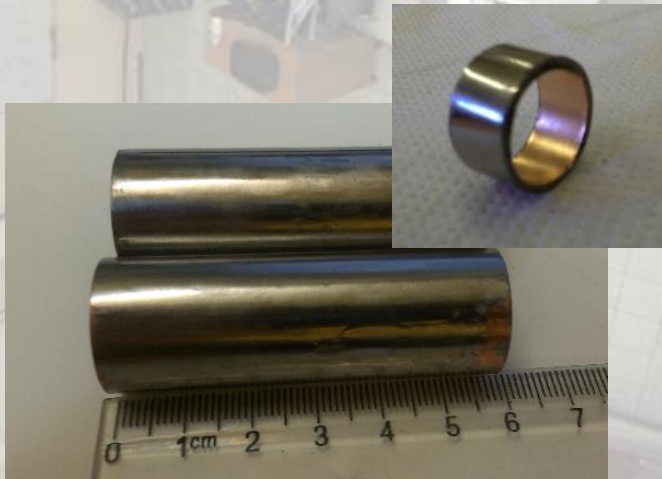
Typical applications: multi metals laminates



WD = 17.0 mm Signal A = SE1 EHT = 20.00 kV
Mag = 500 X Signal B = SE1 Spot Size = 300

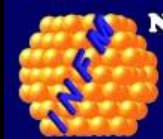
W 100 μ\Cr +Ti 50 μ

200 μm WD = 17.0 mm Signal A = CZ BSD EHT = 20.00 kV
Mag = 170 X Signal B = SE1 Spot Size = 300



25 μ Cu / 100 μ W

100 μm Stage at T = 0.0 ° Signal A = CZ BSDEHT = 20.00 kV
WD = 17.5 mm Mag = 150 X Signal B = SE1 Spot Size = 400



**Thank you
for your attention !**