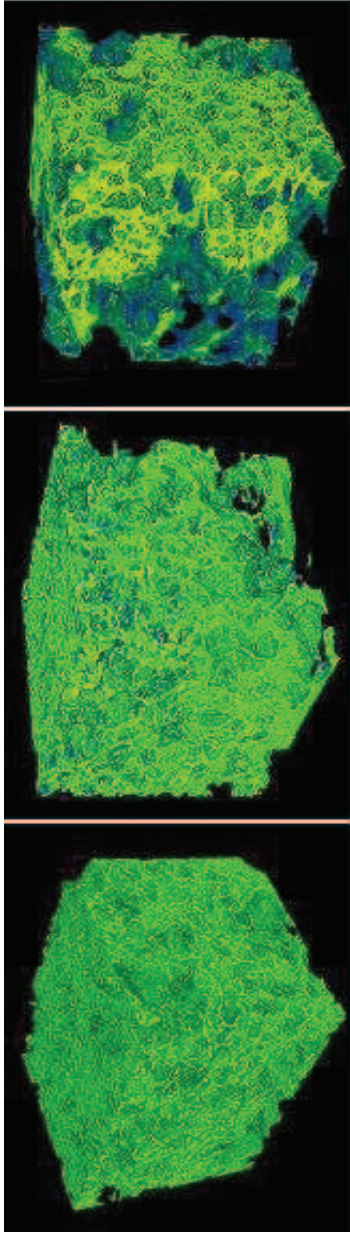




Tailoring of FGMs for biological environments

integrated cycle of material/personal/knowledge exchange



Processing of
graded biomaterials,
e.g. bone-like
glass-ceramic scaffolds,
Courtesy of C. Vitale-Brovarone,
Politecnico di Torino

Joint pan-European **Material Characterization**
(Computer Tomography, microscopy, spectroscopy,
ultrasonics, corrosion testing, poromechanical
testing);

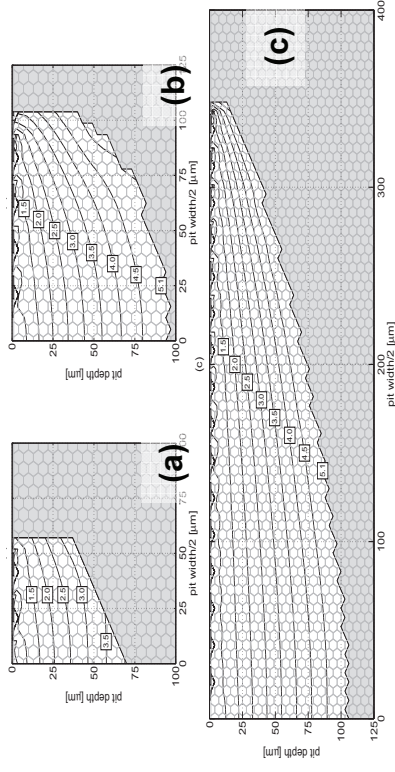
e.g. microCT of untreated and biologically treated
glass-ceramic scaffold
Courtesy of F. Rustichelli, C. Renghini, V. Komlev,
Universita Politecnica delle Marche



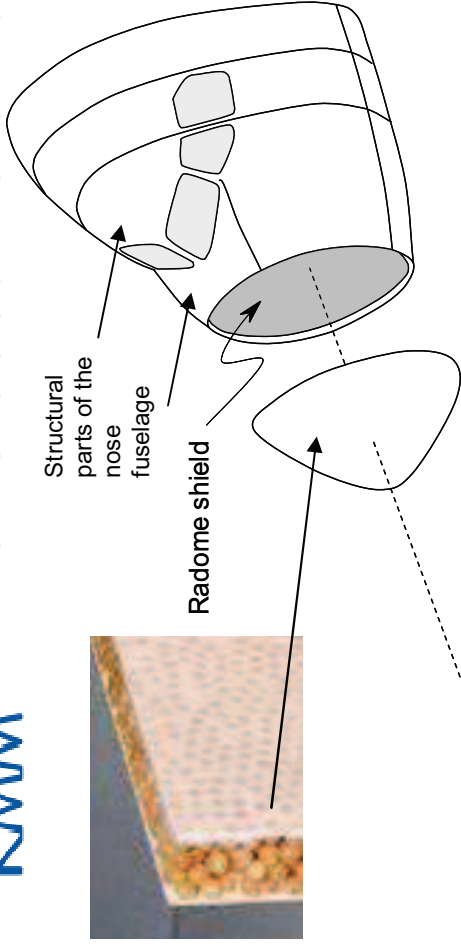
Mathematical Modeling of Material Behavior
(Multiscale mechanics – elasticity, brittle and
ductile failure; electrochemistry);

e.g. Finite Volume Method for combined
activation/diffusion-controlled corrosion of metallic
implants

Courtesy of S. Scheiner and Ch. Hellmich,
Vienna University of Technology

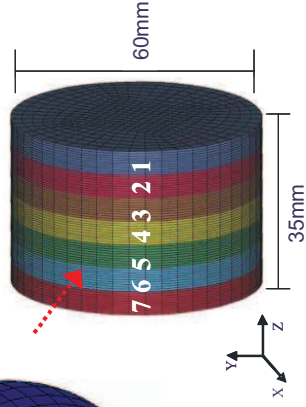
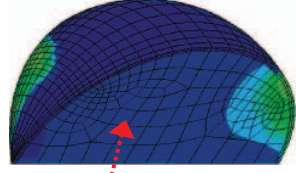
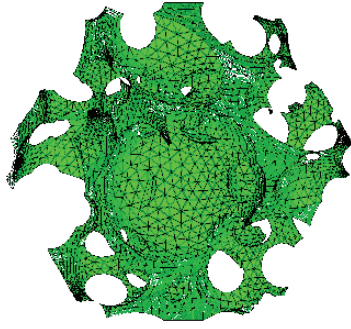


New Multi-functional 3D Cellular Metallic Materials with Graded Pore Density/Geometry

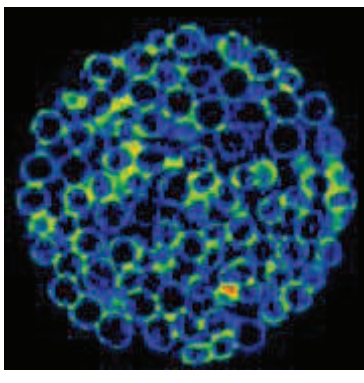
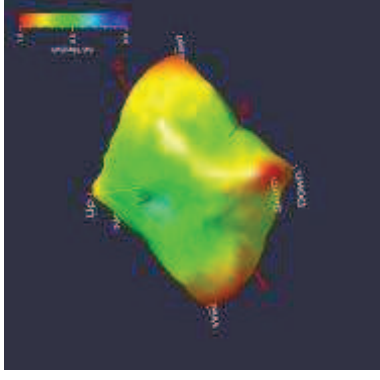


industrial application

processing



mathematical modeling

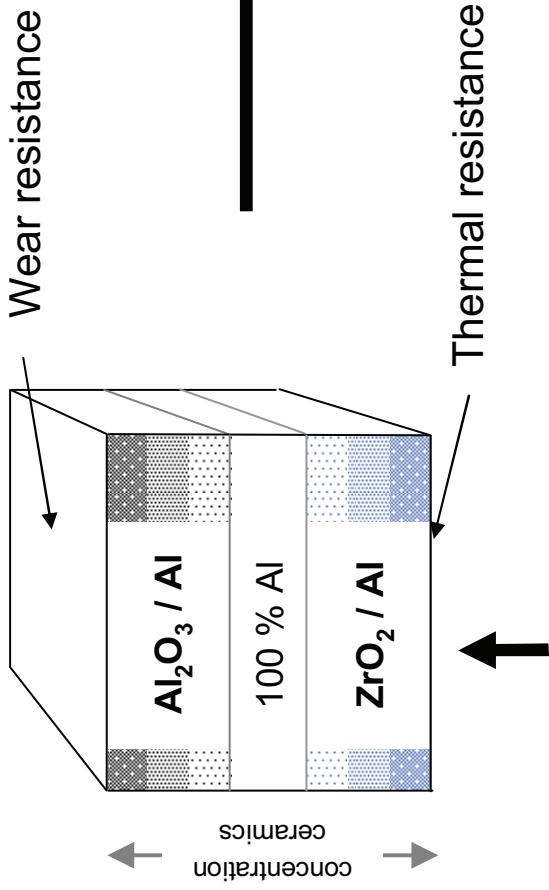


characterization
e.g. CT-based
morphometry

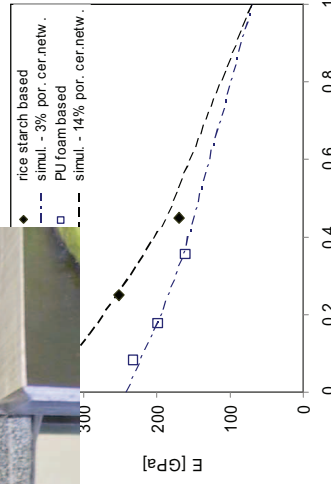
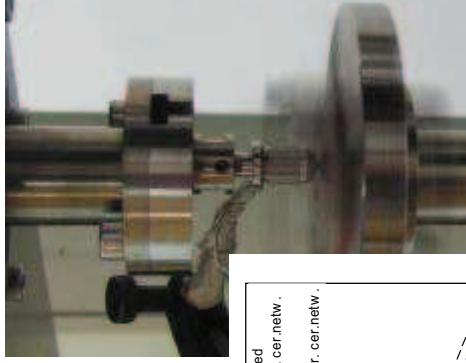
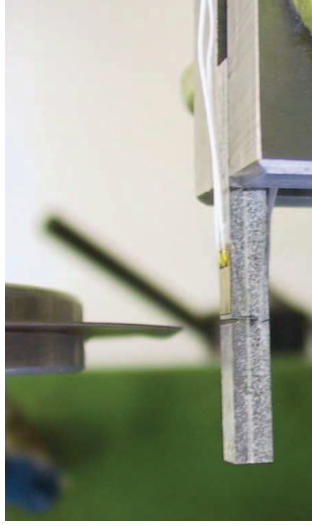
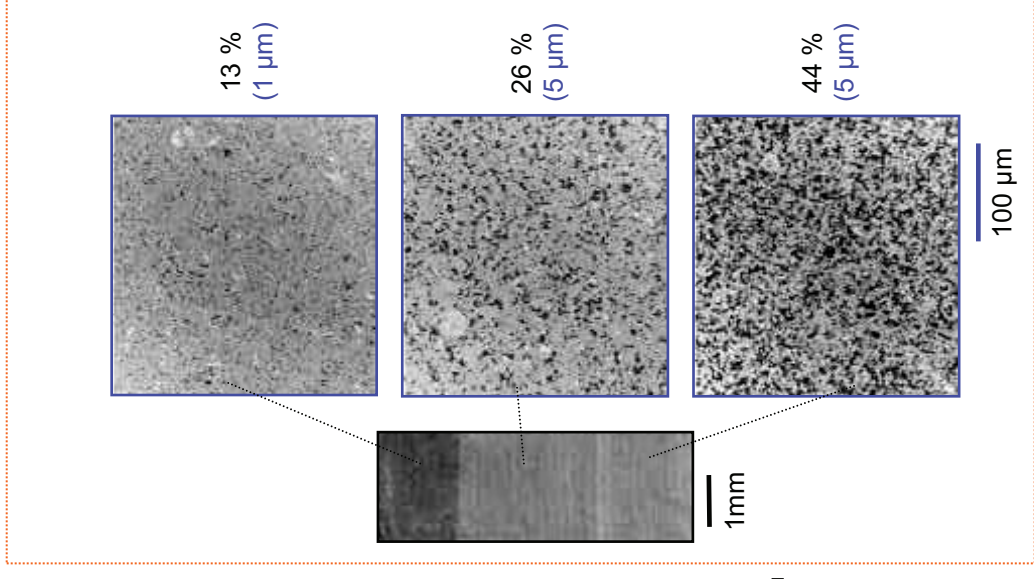


Graded Ceramic Metal Composites with Increased Wear Resistance and Thermal Insulation

Concept



Realization



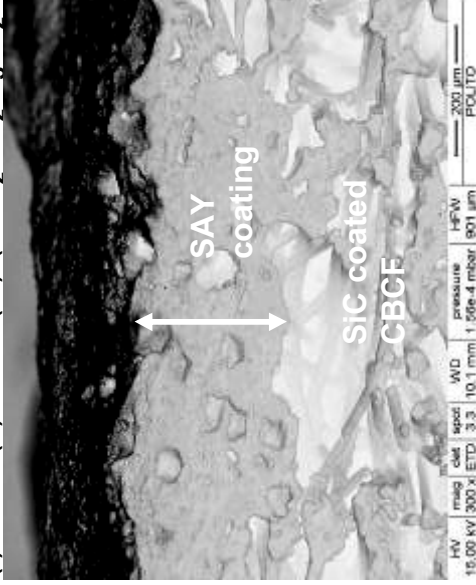
Testing/ Modeling



High Performance Graded Coatings

Erosion resistant coatings for CBCF

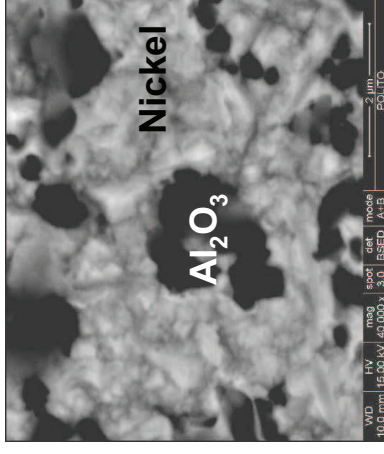
(i) TiC, (ii) SiC, (iii) (SiO₂-Al₂O₃-Y₂O₃)



F. Smeacetto, M. Ferraris, M. Salvo, S.D. Ellacott, A. Ahmed, R.D. Rawlings, A.R. Boccaccini, Protective Coatings For Carbon Bonded Carbon Fibre Composites. CERAMICS INTERNATIONAL. pp. 1297-1301, 2008, Vol. 34.

Graded and multilayered composite coatings by electrochemical techniques

Ni/Al₂O₃ graded composites on steel coatings

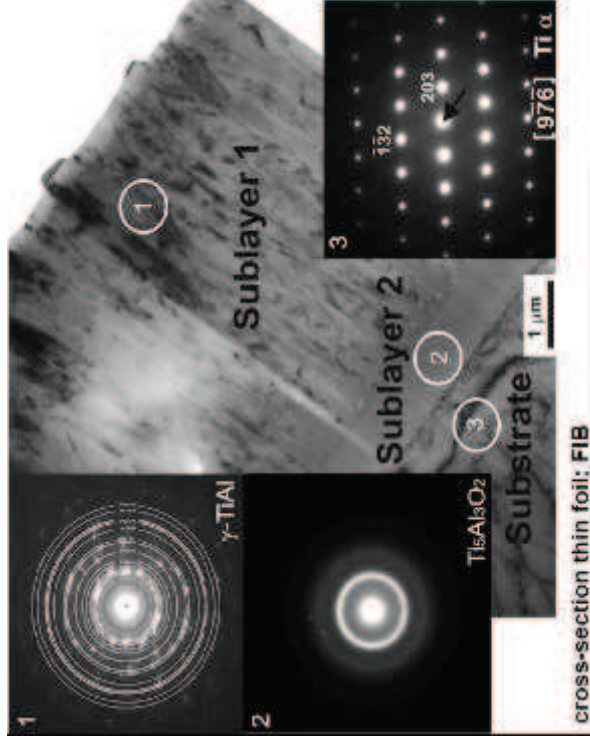


E. Garcia-Lecina; I Garcia-Urritia; J.A. Diez; M. Salvo; F. Smeacetto; G. Gautier; R. Seddon; R. Martin, Electrochemical preparation and characterization of Ni/SiC compositionally graded multilayered coatings, ELECTROCHIMICA ACTA, In press, DOI: 10.1016/j.electacta.2008.04.064

Multilayered coatings on TIMETAL 834 for high temperature applications

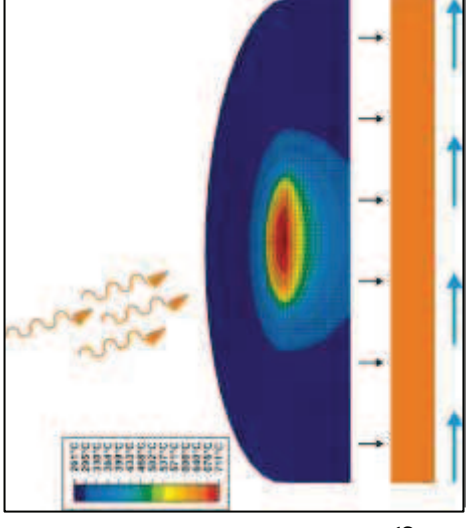
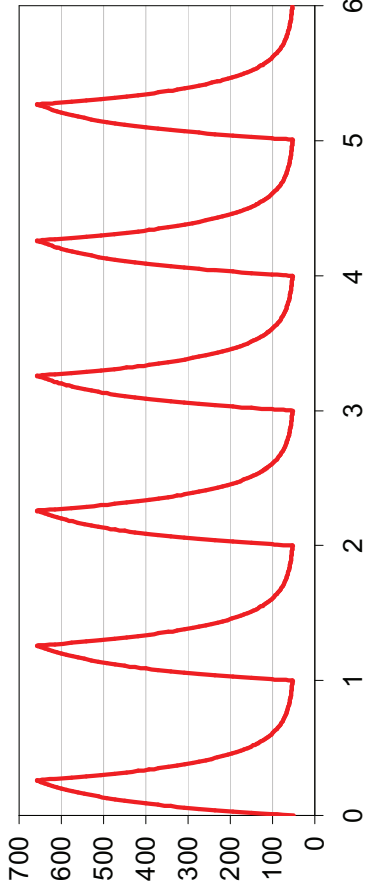
TiAl-Ag
(magnetron sputtering)
thickness 7 μm

T. Moskalewicz, B.Schaffer, A.Manescu, F.Rustichelli, A.Czyrska-Filemonowicz, Microstructure characterisation and stress analysis of the Ti-48Al-2Ag coating on the near-α titanium alloy, *Surface & Coatings Technology* 201 (2007) 7635–7640



Stress-related effects

Thermal fatigue testing of model coatings with a pulsed laser beam



TEM investigation of a thermally cycled CrN coating on a hot work tool steel substrate

Damage at grain boundaries

