
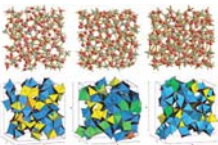
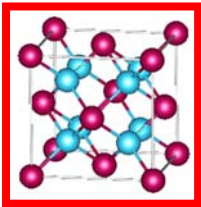

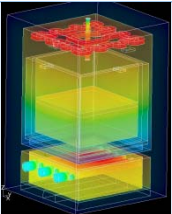
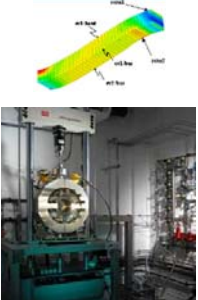


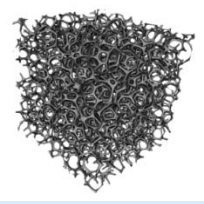
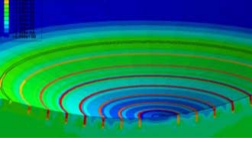












GA TWINN 692216







## The VIRTUAL Centre for Integration of INNOVATIVE synthesis and Processing methods for SUSTAINABLE advanced Materials operating under Extreme Conditions-SUPERMAT



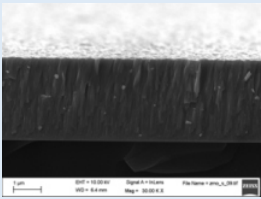

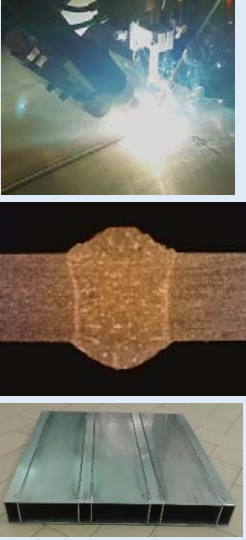

List of services offered by SUPERMAT partners to Industrial Companies and SMEs

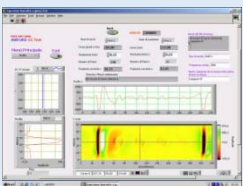
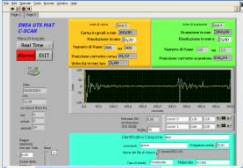
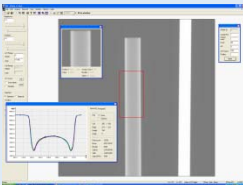
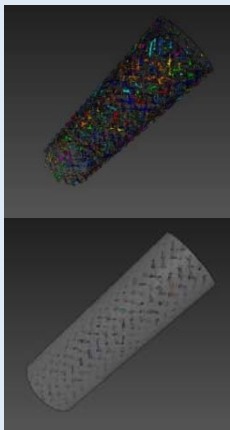
SERVICES OFFERS		Contact
<b>KNOWLEDGE AND RESOURCES DATABASES</b>		
	Main Genome Materials Database	ICCRAM - UBU
	NIMS Materials Database	
 	Coatings design: HSC, Thermokinetics, MATHCAD	IMNR
	Alloys design: MATLAB, THERMOCALC, CALPHAD, MATCALC, MATPRO-J	ENEA CNRS-ICMCB
	Atomistic Modelling, Molecular Dynamics: Quantum Espresso, LAMMPS / HOOMD-BLUE	ICCRAM - UBU
	Finite Elements Methods: COMSOL, ANSYS, ABAQUS, OPENFOAM, ASL	ENEA CNRS-ICMCB ICCRAM – UBU USTRAT
	Ab-initio modelling and high-throughput screening of novel materials, with an internationally recognized expertise on thermal properties and phonon transport (development of the ShengBTE software package)	CEA
	Silicon Crystallisation Simulation: Thermal interaction, hydraulic, resistive or inductive heating, thermal process simulation, materials' defect analysis (Si)	CEA
	Thermomechanical simulation (ANSYS) – material database, mechanical testing.  Hydrogen embrittlement expertise (modelling to experiments (300°C, under pressure))	CEA

	3D Analysis Software for Image Data of Materials: Avizo	ENEA
	Modelling of multi-layered coatings and failures	USTRAT
<b>RESEARCH SERVICES</b>		
	Green Synthesis of custom designed doped and complex ceramic nanopowders Test powders samples up to 100 g /day (TRL 4)	IMNR
	Metallic, ceramic and composite coatings and films using multiple electron-beam PVD system. Coating materials: Metals and alloys (including refractory) Ceramics (bioceramics, refractory) Metal-ceramic composites Functionally Graded Materials Coating surface up to 350 x 350 mm (TRL 5)	IMNR
	Formulation of custom-designed functionalized colloidal dispersions for 3D bio-plotting applications	IMNR
	Technology infrastructure (1400 sqm.) with semi-industrial or industrial tools dedicated to powder metallurgy processes (feedstock preparation, powder injection molding, 3D printing, sintering, etc.), for fabricating high-performance materials (metals, ceramics, refractory, magnetic materials for high-temperature applications, etc.)	CEA
	CVI industrial scale reactor (e.g. for SiC/SiC and C/C ceramic matrix composites)	ENEA

	<p>Pre-industrial PVD system for deposition of hard oxides/nitrides coatings (e.g.. <math>\text{Al}_2\text{O}_3</math>, <math>\text{TiO}_2</math>, <math>\text{TiN}</math>, <math>\text{Si}_3\text{N}_4</math> through HIPIMS (high power impulse magnetron sputtering), BPDMS (bipolar pulsed dual magnetron sputtering), cathodic arc deposition, ion beam sputtering and e-beam evaporation</p>	<p>ENE A</p>
	<p>Plasma spray deposition Detonation gun deposition</p>	<p>ENE A</p>
	<p>Electrospinning</p>	<p>ENE A</p>
	<p>Mechanosynthesis</p>	<p>ENE A</p>
	<p>Micro-manufacturing research lab. including a facility for material synthesis and component forming by electrical field activated sintering technology</p>	<p>USTRAT</p>




	<p>Spark Plasma sintering, Hydrothermal Sintering, Cold isostatic pressing, Sintering under gas (O<sub>2</sub>, N<sub>2</sub>, Ar), Hot pressing, Vacuum sintering, High pressure solid reaction chemistry</p>	<p>ICMBC-CNRS</p>
<b>MATERIALS TESTING AND QUALITY ASSURANCE</b>		
	<p>Complete chemical analysis of solids, coatings and solutions using ICP-OES coupled with laser ablation and AAS spectral systems</p>	<p>IMNR</p>
	<p>Thermal characterisation of materials (phase transitions, enthalpy of reactions, activation energy) by DSC – TG methods</p>	<p>IMNR</p>
	<p>Nano-characterisation platform, housing around 40 pieces of heavy research equipment operated by a staff of experienced researchers and technicians (Ion-beam and X-ray beam, surface analysis, near-field electron microscopy, optical characterization, magnetic resonance, and sample preparation), and offering an access to large research instruments located in Grenoble (synchrotron and neutron capabilities).</p>	<p>CEA</p>
	<p>Indoor and outdoor solar characterisation platform Accelerating aging test for PV modules platform</p>	<p>CEA</p>
	<p>Thermomechanical characterisation of material from TR to 1500°C (Tensile, fatigue, creep, compression toughness tests) Metallography analysis, metallurgical expertise</p>	<p>CEA</p>

	<p>Thermal systems platform (thermal energy storage, sensitive heat, latent heat, thermochemical)</p>	CEA
	<p>Mechanical testing for hardness and adhesion of coatings through nanoindentation and scratch test - in SEM and in Alr</p>	ENECA
	<p>Characterization techniques for coatings: high resolution microscopy (FESEM, HeIM, AFM), structural characterization (XRD, SAXS), x-ray compositional analysis (XPS-UPS), optical characterizations, thermal analyses (DSC, TGA)</p>	ENECA
	<p>CSP activities: residential dish and large scale through systems; molten salt storage; emissivity testing</p>	ENECA
	<p>welding (laser, e-beam, TIG)</p>	ENECA
	<p>Characterization for ceramics: X-ray diffraction, FTIR, FT-Raman, DSC, TG/DTA, Thermal diffusivity, EPMA, FE-SEM, TEM, Mechanical hardness (Vickers, Knoop) and optical characterization</p>	ICMCB-CNRS



Non Destructive Testing and Evaluation  
by means of:  
High Resolution X-ray Computed Tomography,  
Thermography, Automatic Ultrasonic testing,  
Digital radiography, Eddy Current Testing,  
Endoscope Inspection

ENEA  
&  
ICCRAM

<b>TRAINING AND EDUCATIONAL SERVICES</b>		
	Industrial seminars and webinars for employees from automotive, energy, machinery and thermal equipment companies. Introduction of new concepts and methods for process specialists, process managers and innovation managers.	IMNR
	Training and education PV: from feedstock to system	CEA
	Advanced Materials Research Lab. (AMRL) with a series of new material-characterisation and testing equipment, including FE-SEM, W-SEM, XRD, GD-OES, TGA/DSC, AFM, and thermo, thermo-mechanical, fluidic and mechanical testing machines.	USTRAT
	Advanced sintering processes and ceramic characterization	ICMCB-CNRS