INTERNATIONAL RESEARCH CENTER IN CRITICAL RAW MATERIALS FOR ADVANCED INDUSTRIAL TECHNOLOGIES

INNOVATION IN MATERIALS FOR EXTREME APPLICATIONS USING COMPLEMENTARY CAPABILITIES: MULTI-SCALE MODELING, CRITICAL RAW MATERIALS SUBSTITUTION, ECO-DESING AND NANOSAFETY ASSESSMENT

Universidad de Burgos - ICCRAM

Management and Scientific Contact:

PhD Santiago Cuesta (ICCRAM Director)

UNIVERSIDAD DE BURGOS

ICCRAM
International Research Center in Critical RAw Materials for Advanced Industrial Technologies

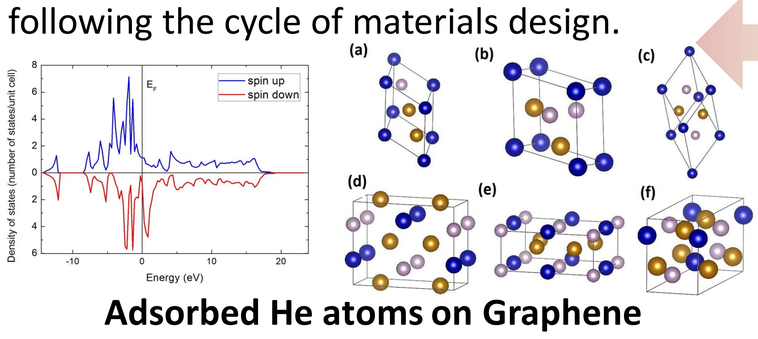
Materials for extreme conditions, Critical Raw Materials Substitution, Materials flow analysis

Ceramics | Nanoporous | Nanostructured Alloys | Super-Alloys | Nanofibers | Graphene | Metal matrix composites | Biocompatible Materials | Drug Delivery Nanocarriers

From Materials by Design, Prototype Up Scaling and Ice-Modelling of Durability

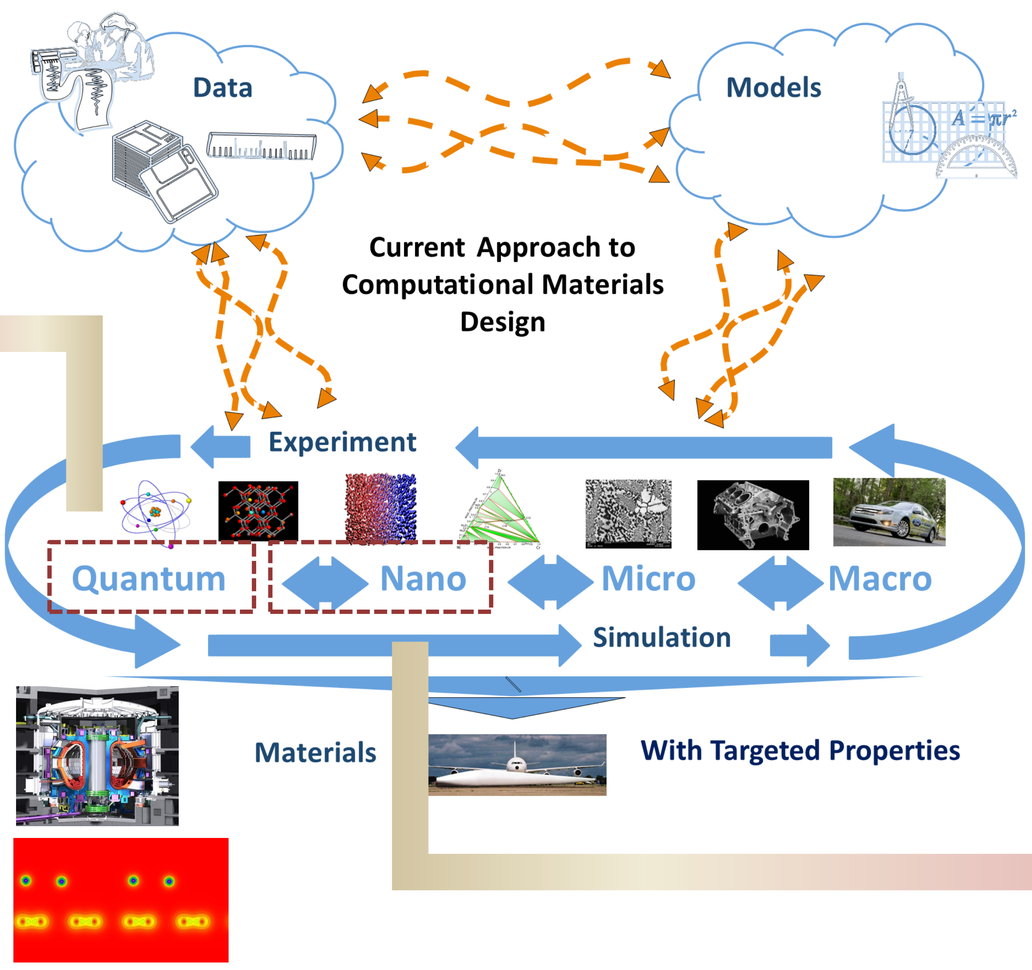
Rare-earth free permanent magnet

Several structures without rare-earth elements are generated by Density Functional Theory (DFT). The structures with better properties are potentially selected for permanent magnets application and later research at further multi-scale modelling following the cycle of materials design.



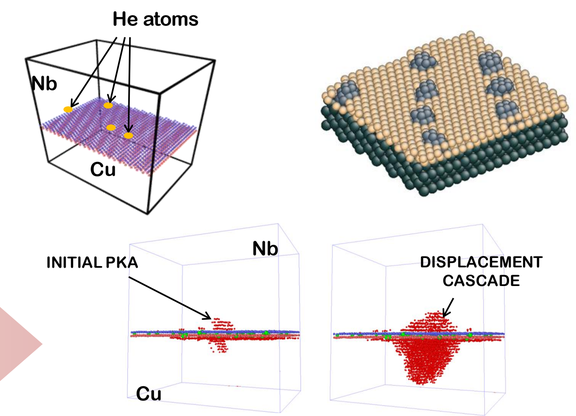
Adsorbed He atoms on Graphene

The study of the saturation and diffusion of helium on graphene provides the possibility of graphene acting as a nanomembrane, for the storage and retention of He, which can be of importance in complex nuclear fusion systems as ITER (International Thermonuclear Experimental **Reactor).**



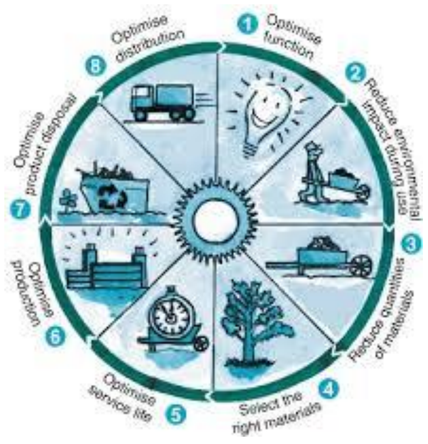
Self-healing and radiation resistant materials

Cu/Nb metallic nanolayers have shown self healing properties under radiation and the ability to trap He atoms at interfaces (centers of adsorption). Molecular Dynamics techniques (MD) allows to determined by the first time the capability of the Cu/Nb interface to trap He Atoms and microstructural changes due to the accommodation of high concentrations of helium atoms.



Sustainability, Eco-Toxicity and Nanosafety Assessment

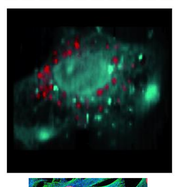
Sustainability assessment from Life cycle and Life cycle Cost analysis.
The environmental performance is evaluated in addition by eco-toxicity test at different environments and organisms.

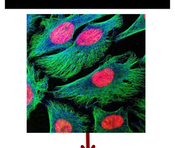


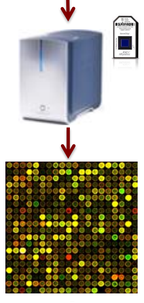
Advance RAMAN Microscopy: Imaging-NP-cell localization. Distribution of iron-oxide core functionalized NP in/around model cell (BEAS-28cell line)

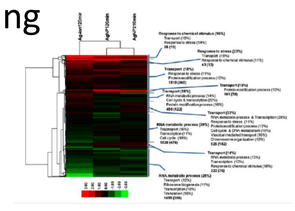
Evaluation in the global gene response using microarrays to detect changes in the gene expression of cells exposed to NPs.

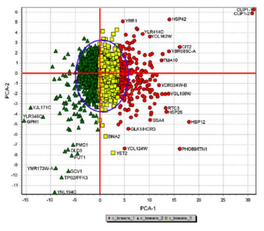
Bioinformatics analysis of results: Normalization, significance analysis of microarrays, Principal Component Analysis, clustering

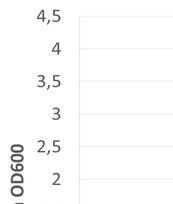












Graphene materials safety on *Saccharomyces cerevisiae*

Short and medium-long term studies, changes in viability, cytotoxicity, genotoxicity and transcriptome in cells exposed to these materials

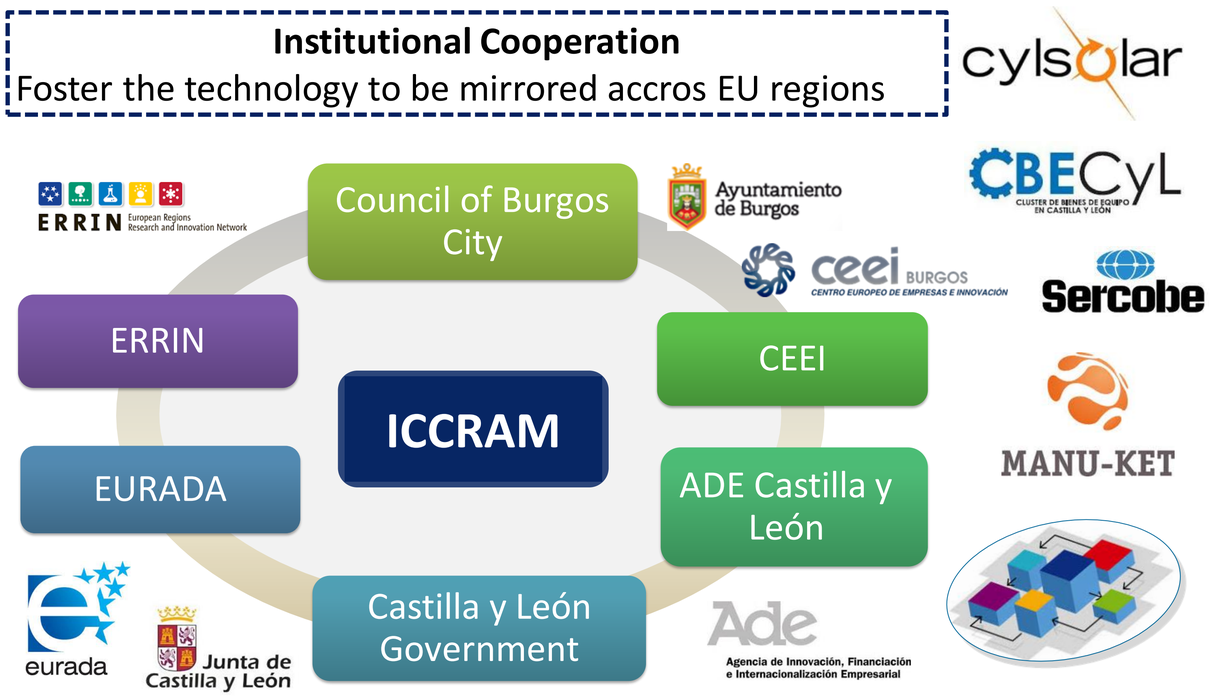
Response to NPs in human Bronchial Epithelial cells

Genomic analysis to detect trascriptional response and to know the kind of damage (oxidative toxicity, cell wall damage,…)

Demonstration, Replicability and Intrinsic Path to Innovation

Institutional Cooperation

Foster the technology to be mirrored accros EU regions



Present On-going EU Projects

- **NANOGENTOOLS**-H2020 MSCA RISE 2015
- **SUPERMAT**-H2020 TWINN 2015
- **NOVAMAG**-H2020 NMP 2015
- **REFRAM** MSP- H2020 WASTE 4d 2015
- **Nano-PieZoelecTrics**-H2020 MSCA IF N
- **ICARUS**-H2020-FETOPEN-2014-2015-GA-713514
- **H2020-COST** -Solutions for Critical Raw Materials Under Extreme Conditions
- Join Programme on Nuclear Materials – **EERA**
- **SCRREEN** H2020-SC5-2016-OneStageB-GA-730227
- **SOLUTION** H2020-MSCA-ITN-2016-GA-721642
- **NEXTOWER** H2020-NMBP-2016-two-stage-GA-721045
- **RAW-NANOVALUE**-EIP. Commitment Raw Materials
- **CO2MPRISE** H2020-MSCA-RISE-2016 -734873
- **DRYSE**-H2020-MSCA-RISE-2016 -734434

Edificio I+D+i; Plaza Misael Bañuelos, s/n 09001 Burgos (Spain)

Contact us: *secretaria.iccram@ubu.es; eu-projects.iccram@ubu.es*

ICCRAM
International Research Center in Critical RAw Materials for Advanced Industrial Technologies