CONAMA 2018
CONGRESO NACIONAL DEL MEDIO AMBIENTE

RUMBO 20.30.

Congreso Nacional del Medio Ambiente
Madrid del 26 al 29 de noviembre de 2018

Mesa 2. Debate. Nanomateriales, retos futuros. RETOS DE LOS MATERIALES AVANZADOS MATERIAS PRIMAS Y ECONOMIA CIRCULAR

Dr. Santiago Cuesta Lopez
FUNDACION ICAMCYL

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ICAMCYL

Centro internacional de materiales avanzados y materias primas
International center for advanced materials and raw materials

Dr. Santiago Cuesta Director General

FUNDACION ICAMCyL:

Centro internacional en materiales avanzados y materias primas de Castilla y León

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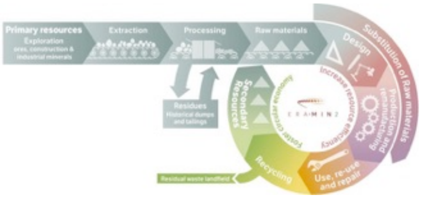
Sustainable mining

Advanced materials

Circular economy



SD Goals

Mining and extractive industries

Aerospace

Manufacturing

Solar energy

Automotiv

Glass

International networks:

EMIRI

EERA European Energy Research Alliance

EUMAT

extreme CRM

cost EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

eit RawMaterials

NANOfutures

Raw Materials Alternate Recycle Extract

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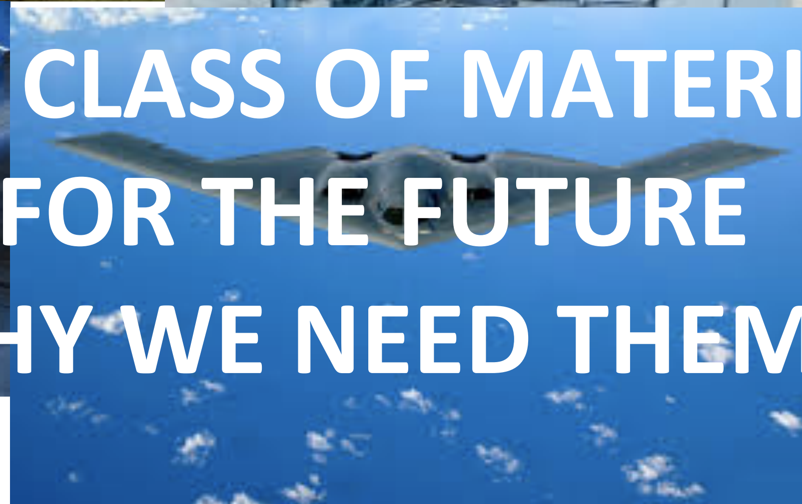
International center for advanced materials and raw materials

- **Advanced materials** and nanomaterials preparation and characterization
- Materials design, testing and integrated computational engineering including **multiscale modelling**
- **Energy** storage and conversion
- **Sustainability** and natural resources
- Circular economy and **raw materials** (including LCA/LCC)
- **Additive manufacturing (AM)**

NEW CLASS OF MATERIALS FOR THE FUTURE WHY WE NEED THEM?









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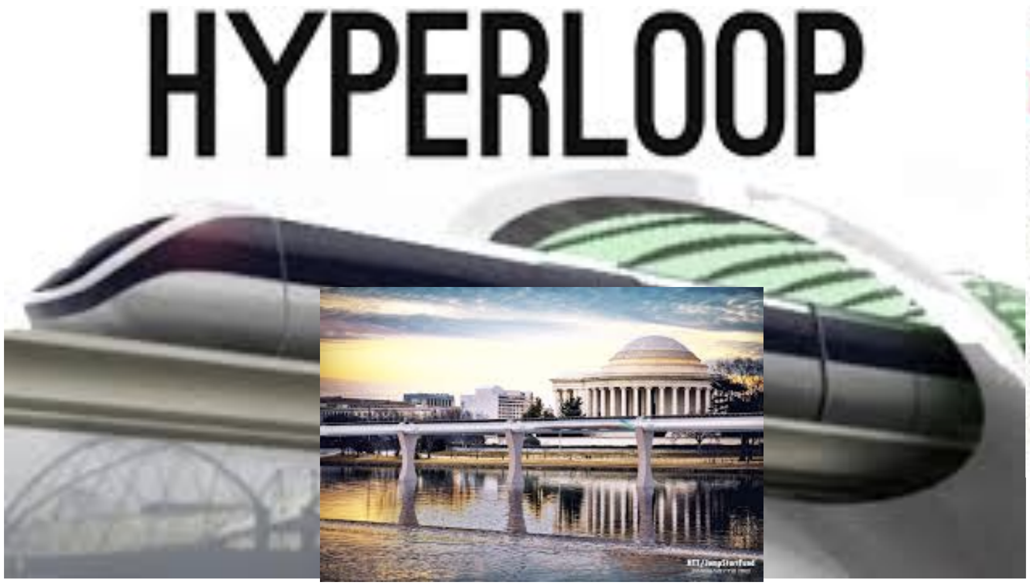

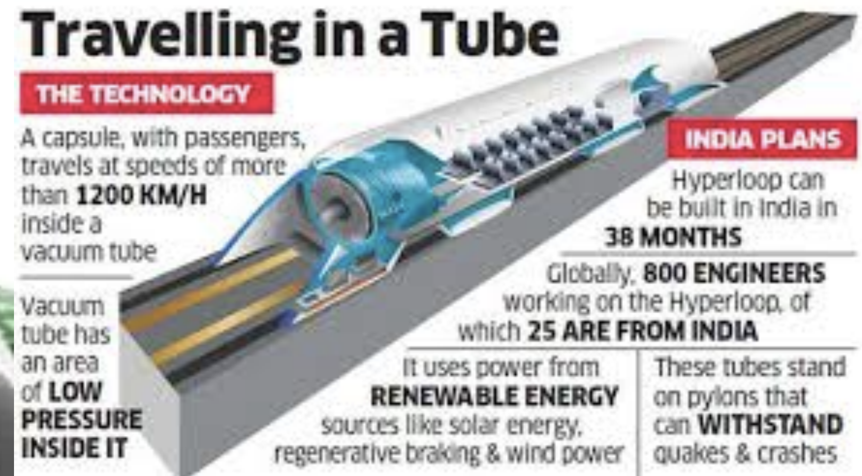

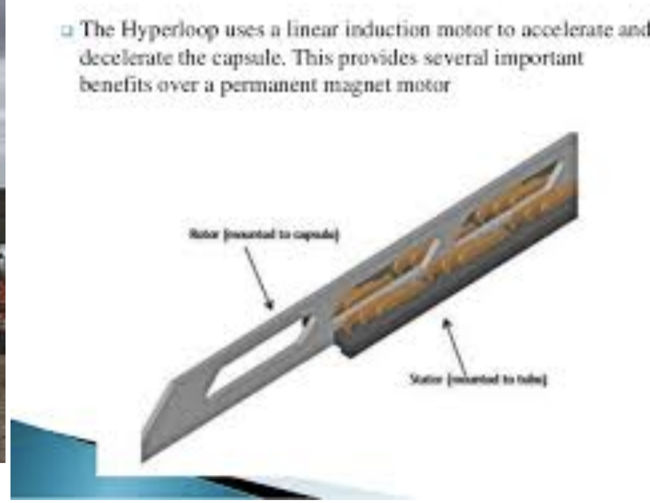

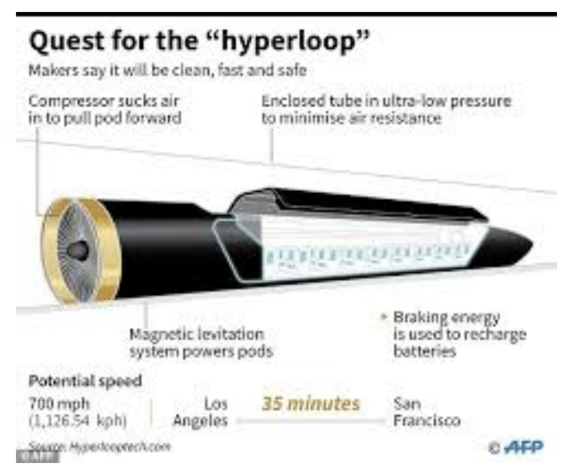

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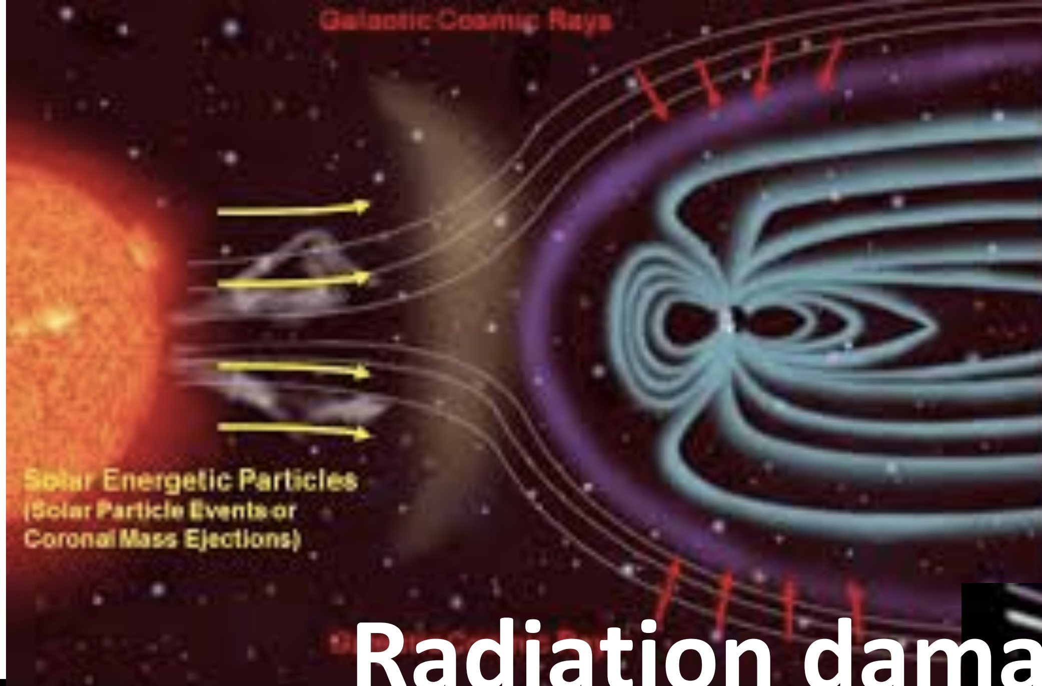
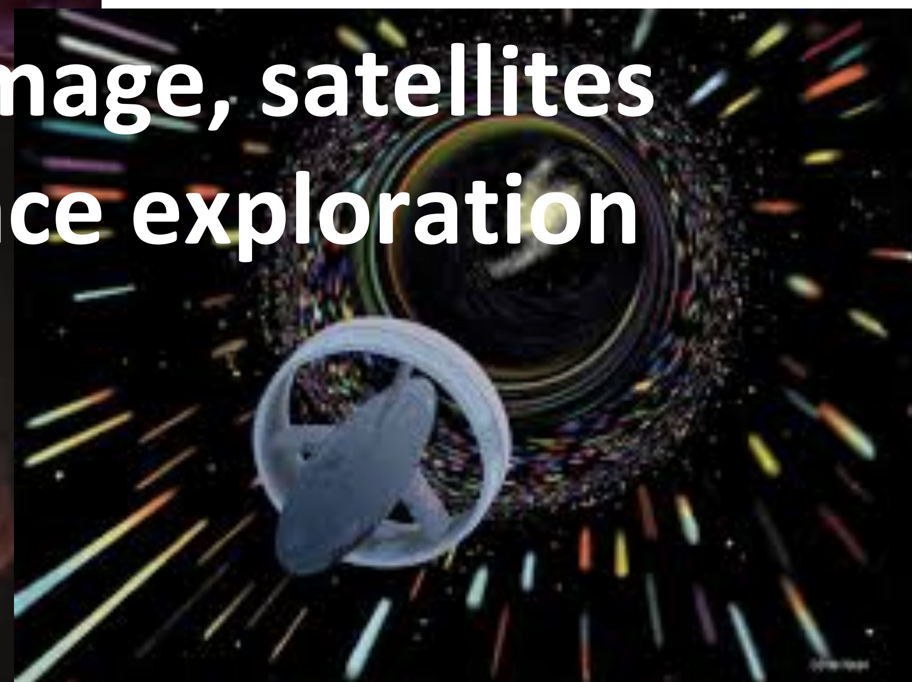


Exploring the Extremes of Space Weather

Van Allen Probes

Radiation damage, satellites and deep space exploration



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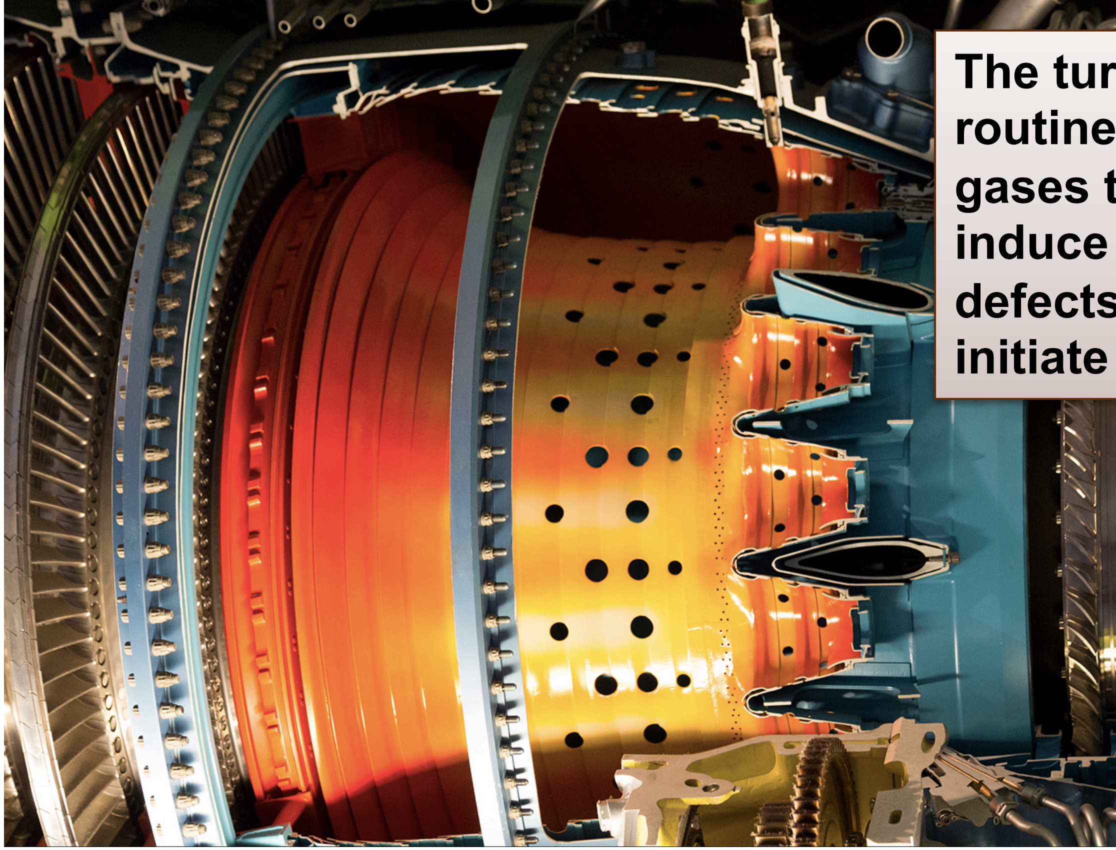
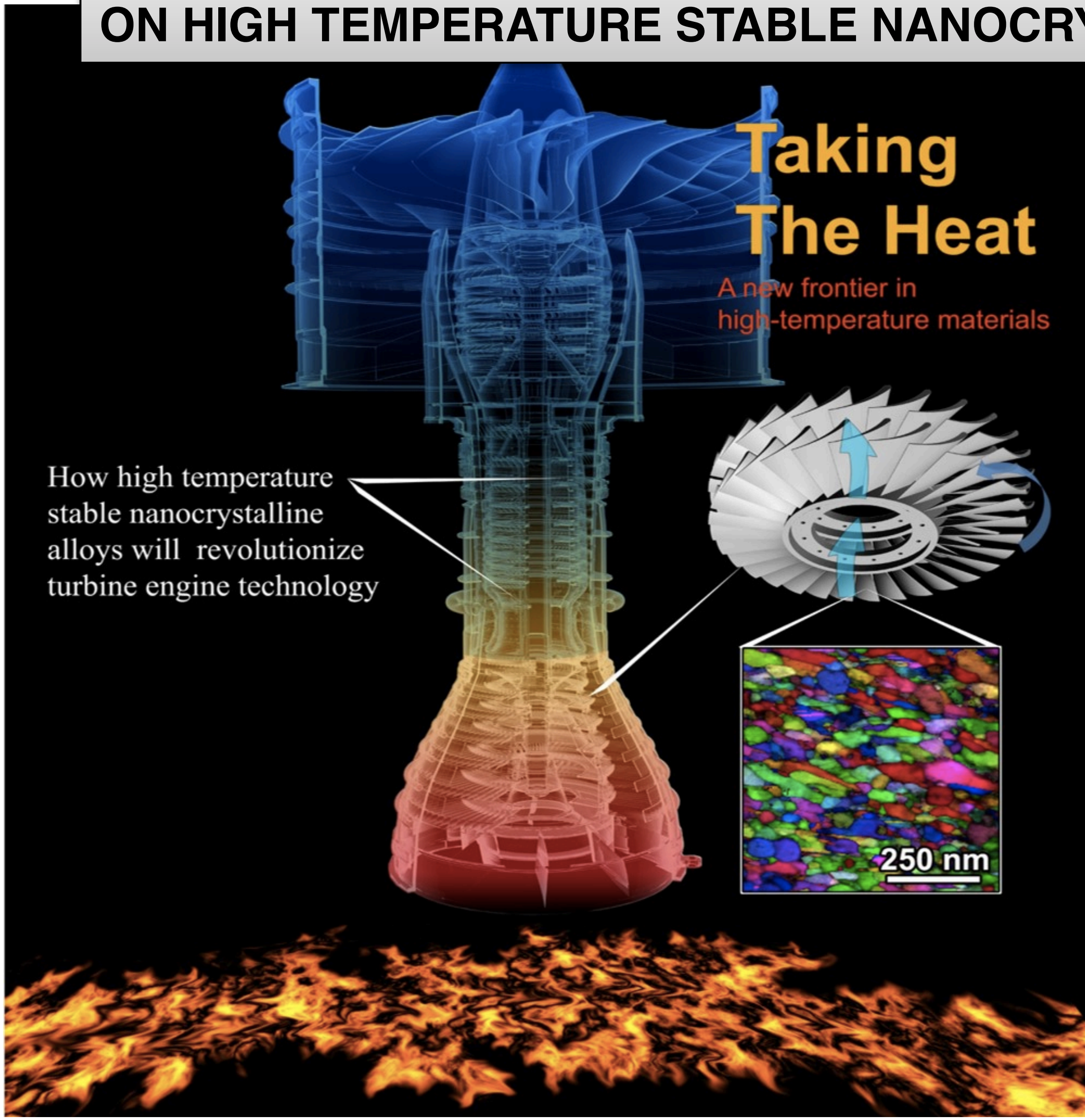


The turbine disk and blades are routinely exposed to temperatures and gases that exceed 700°C, which may induce corrosion. Even corrosion defects as small as 5-10 microns can initiate fatigue cracking.

Problem: Hot-stage turbine disks now operate at sufficiently high temperatures that hot corrosion and oxidation can initiate premature fatigue failure in these components.

If we develop materials with relatively high expansion, damage tolerance, and oxidation/corrosion resistance – we will find promise for protecting turbine components operating in high-temperature corrosive environments.

THE FUTURE FOR MATERIALS UNDER EXTREME CONDITIONS RELIES ON HIGH TEMPERATURE STABLE NANOCRYSTALLINE ALLOYS



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Archive > Volume 537 > Issue 7620 > Letters > Article

ARTICLE PREVIEW

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NATURE | LETTER

日本語要約

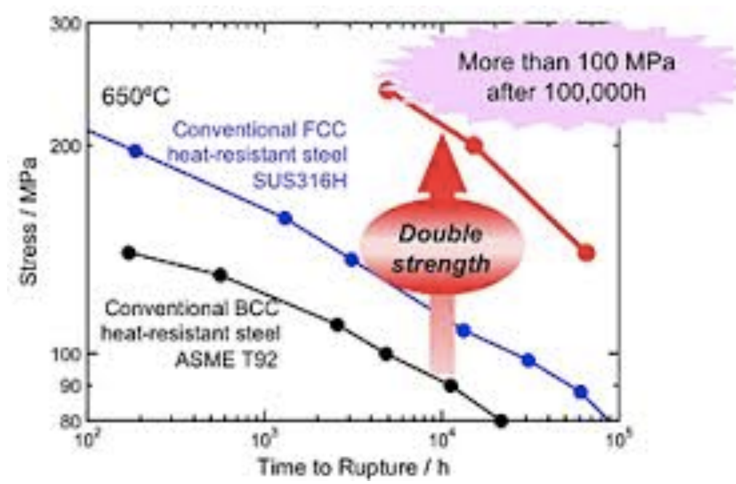
Extreme creep resistance in a microstructurally stable nanocrystalline alloy

K. A. Darling, M. Rajagopalan, M. Komarasamy, M. A. Bhatia, B. C. Hornbuckle, R. S. Mishra & K. N. Solanki

Affiliations | Contributions | Corresponding author

Nature **537**, 378–381 (15 September 2016) | doi:10.1038/nature19313

Received 04 May 2016 | Accepted 08 July 2016 | Published online 14 September 2016



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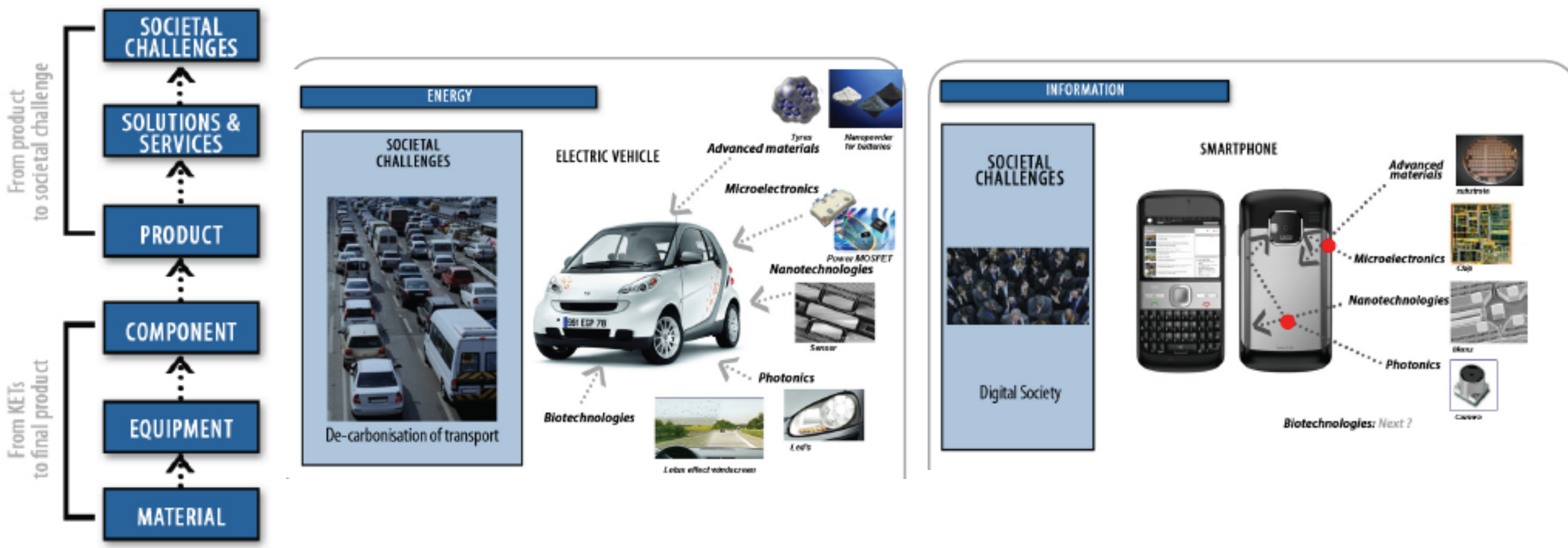
Advanced materials are strategic to Europe to address competitiveness & societal challenges

Advanced materials is a key enabling technology (KET) for EU

- Contributing to economic **growth & employment** in EU through **innovative products**
- **Strengthening** & dynamizing existing European **value chains** (often at their basis)
- Creating new jobs and competitiveness by **enabling follow-through applications**
- Enabling development of products & solutions to **address societal challenges**



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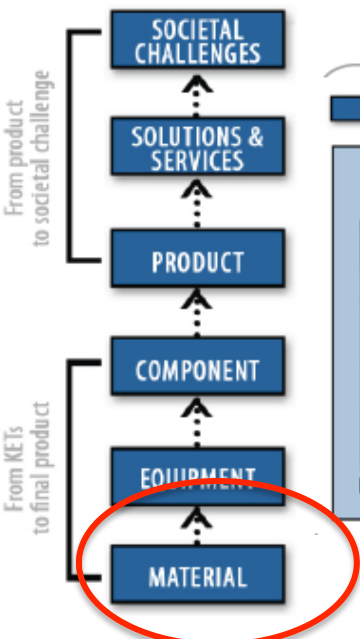
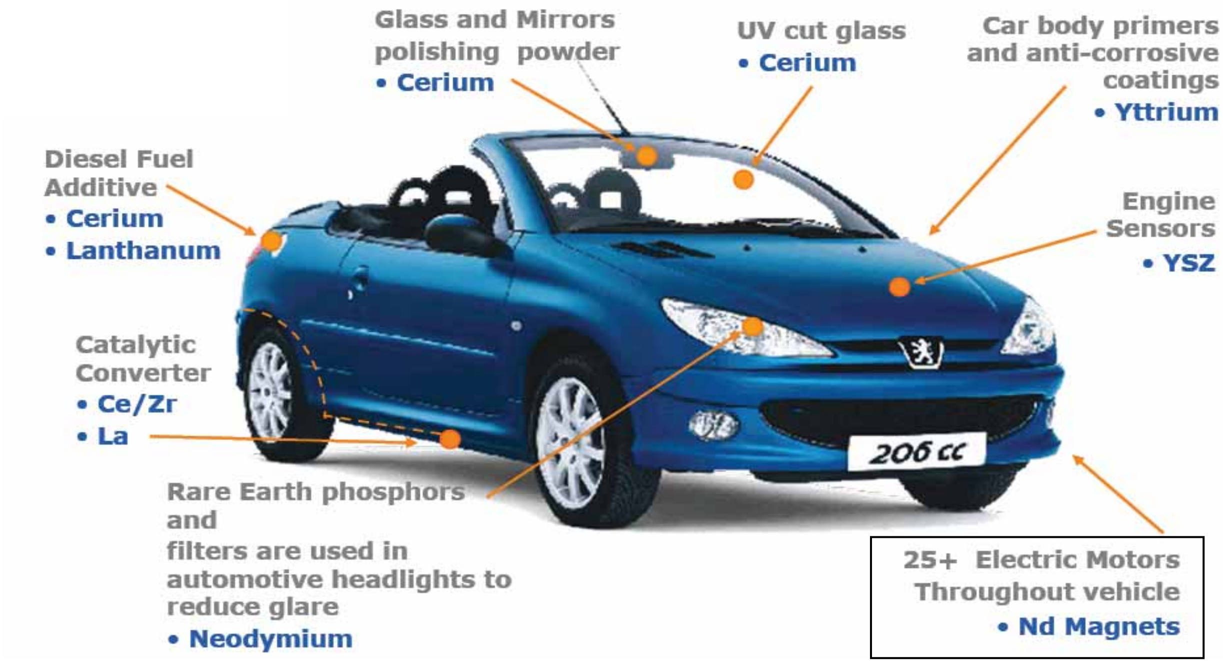


Qué ocurre si la base de la cadena depende de la disponibilidad de materias primas?

Automotive sector

" REE : a huge concern for the auto manufacturing sector "



Numerous REE inside

Multiple components and subsystems that use rare earths include:

- NiMH batteries: lanthanum
- Electric motors and regenerative braking: neodymium, praseodymium, dysprosium, terbium;
- Exhaust catalysts: cerium and lanthanum;
- Glass : cerium

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THE FUTURE OF PRESENT EU TECHNOLOGY RELIES ON CRITICAL RAW MATERIALS

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FIGHT FOR RARE EARTH

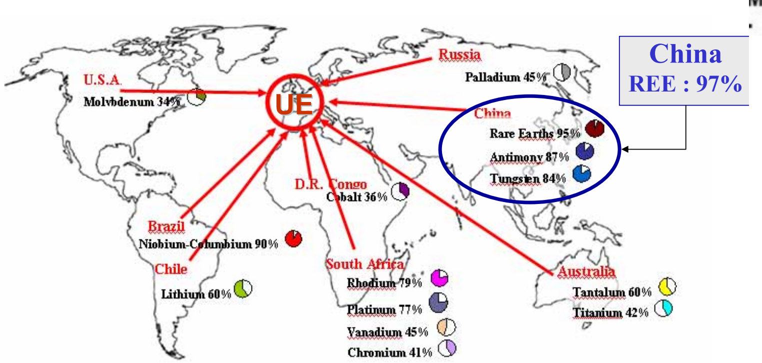
From iron ore to timber, China relies on foreign supplies to fuel its growth. But when it comes to rare earth metals—essential for clean energy and electronics—China dominates. The rest of the world is worried.

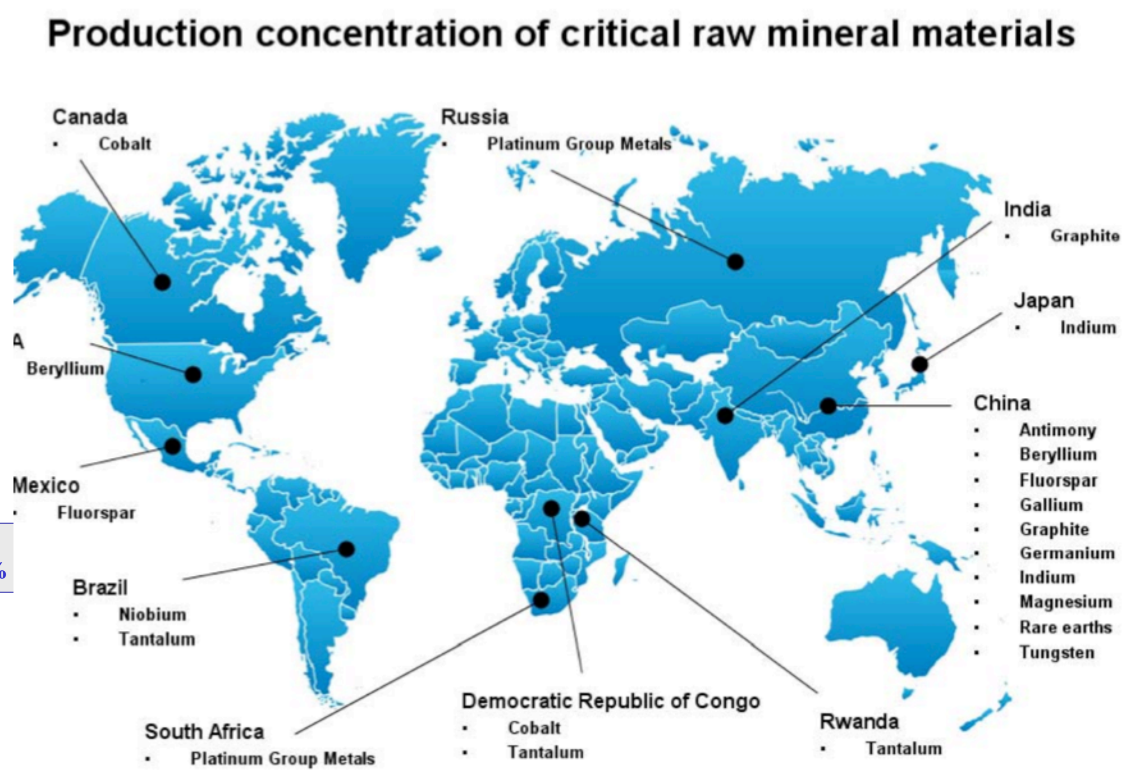
REUTERS

CRMs are a clear world-wide problem …
Rare Earths *"the 21th gold fever"*?

Rare Metals

A strong UE importation dependancy &
Some countries with a monopolistic production





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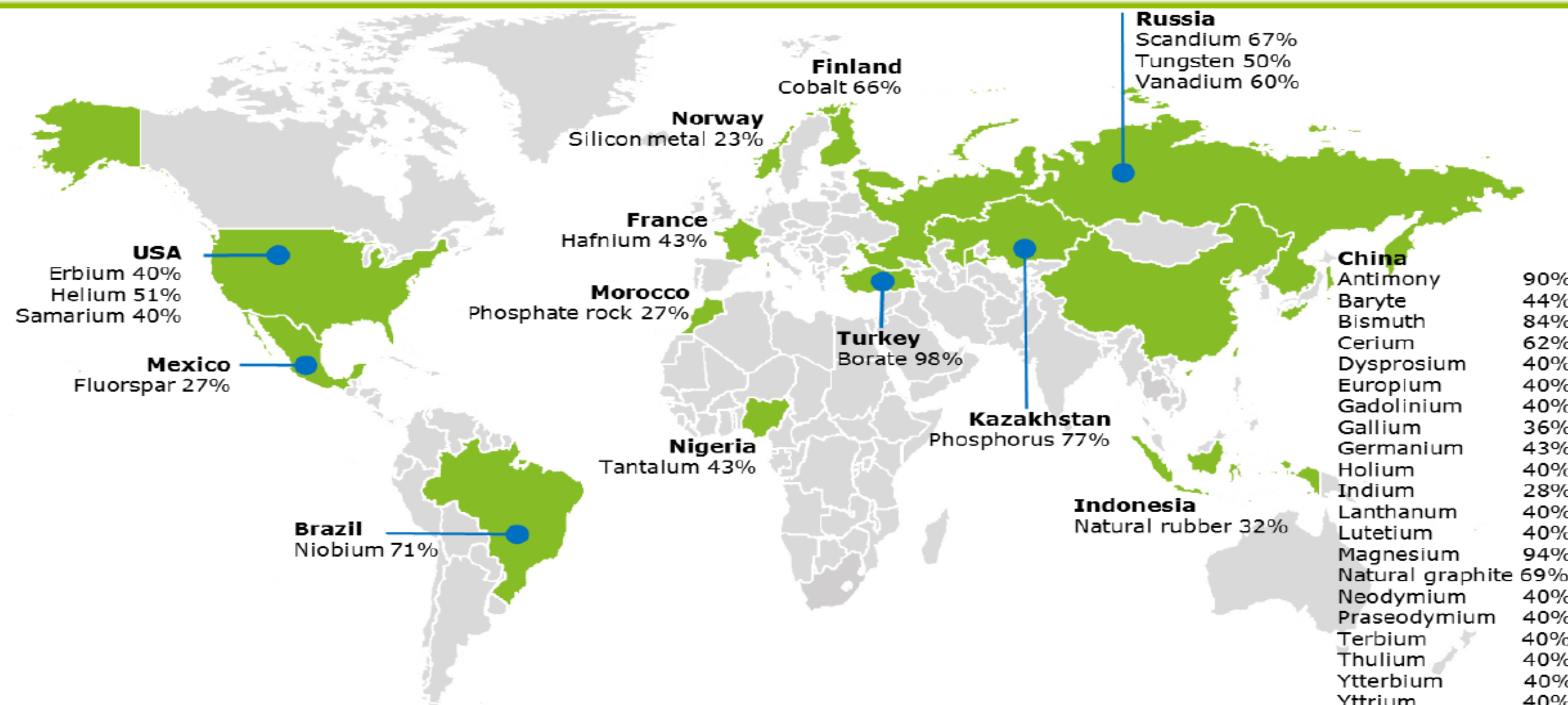
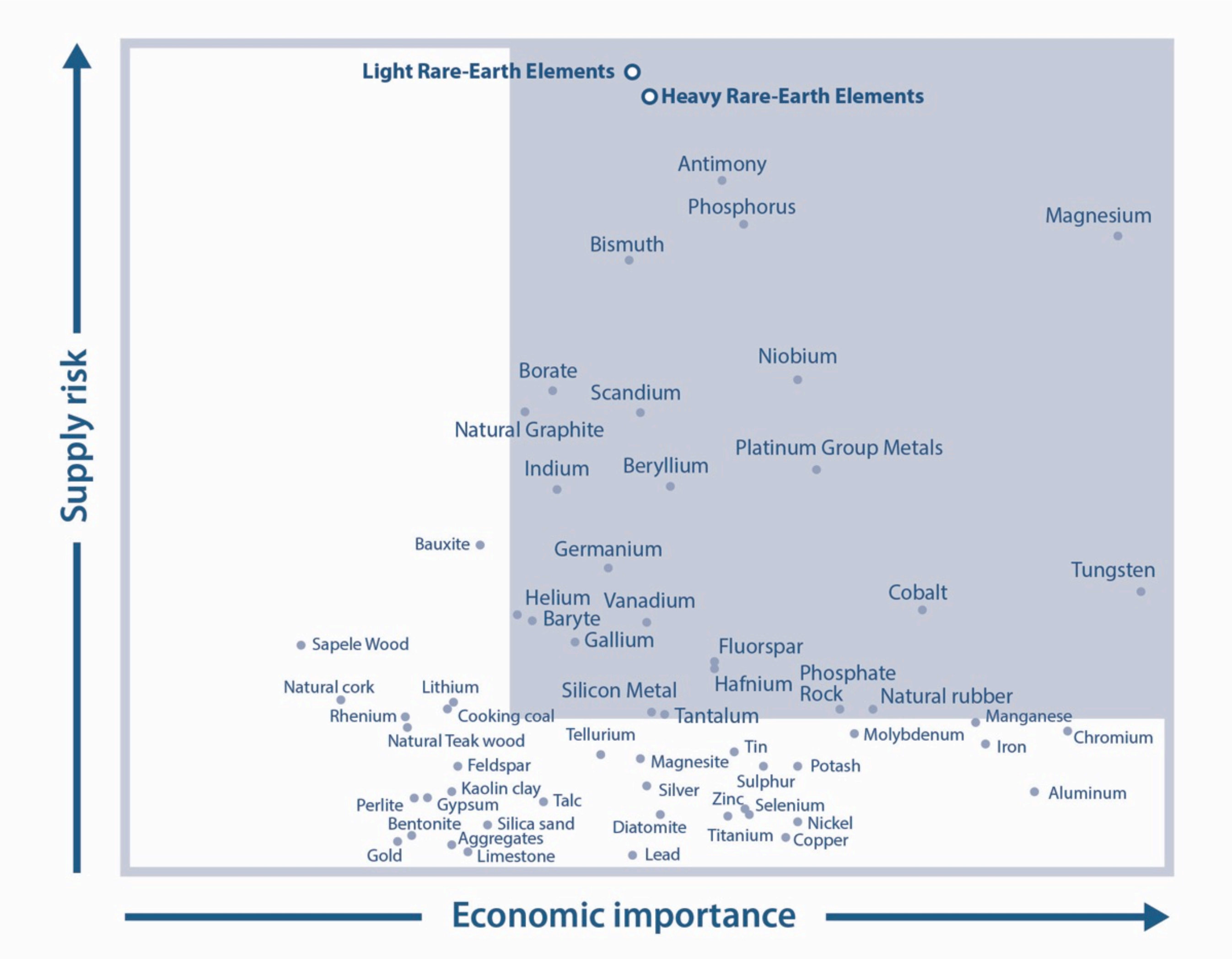
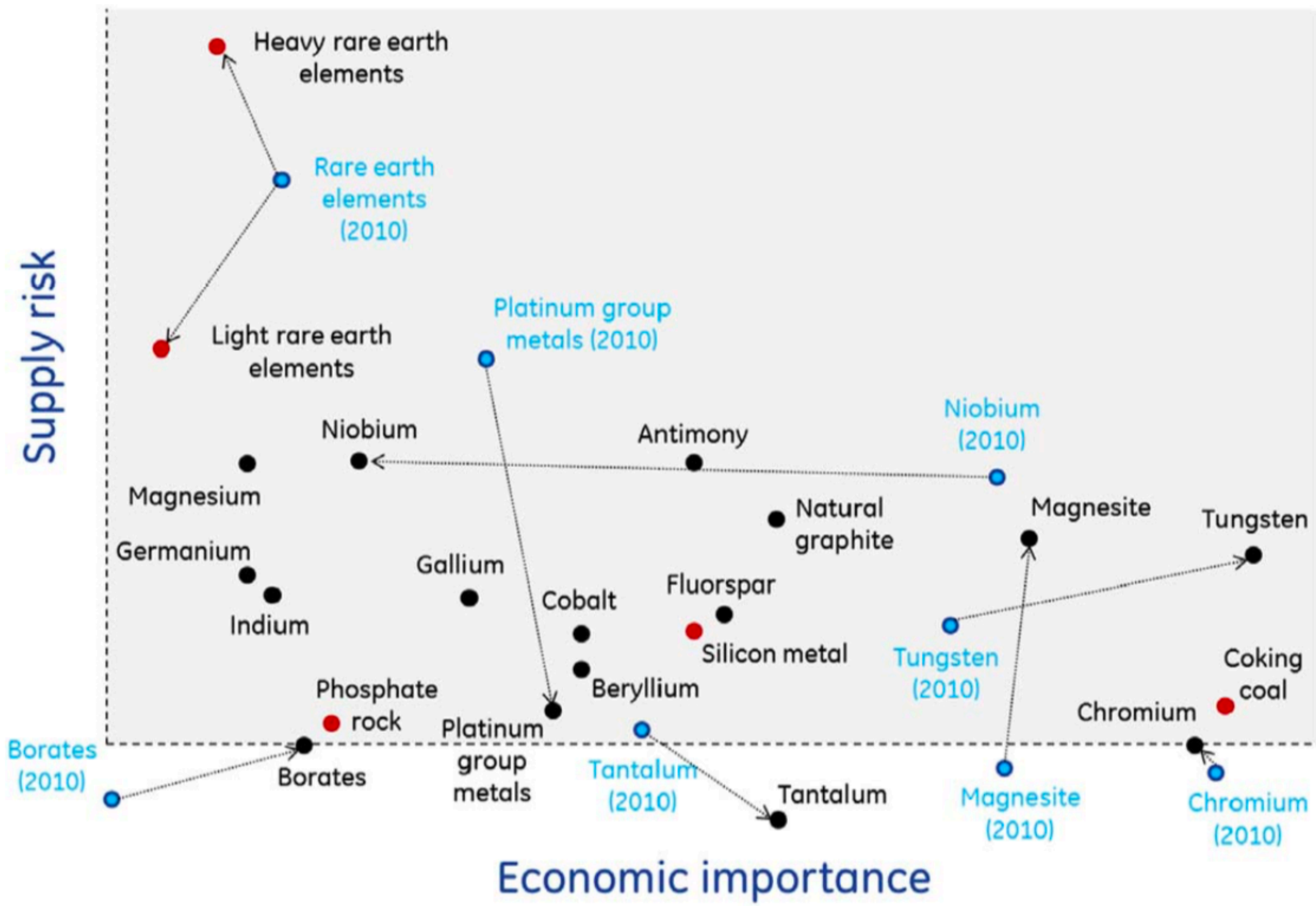


fuente: *Report on Critical Raw Materials and the Circular Economy*, EC 2018


Supply risk
Economic importance
Light Rare-Earth Elements
Heavy Rare-Earth Elements
Antimony
Phosphorus
Magnesium
Bismuth
Niobium
Borate
Scandium
Natural Graphite
Platinum Group Metals
Indium
Beryllium
Bauxite
Germanium
Tungsten
Cobalt
Helium
Vanadium
Baryte
Gallium
Sapele Wood
Fluorspar
Natural cork
Lithium
Silicon Metal
Hafnium
Phosphate Rock
Natural rubber
Rhenium
Cooking coal
Tantalum
Manganese
Natural Teak wood
Tellurium
Molybdenum
Chromium
Tin
Iron
Feldspar
Magnesite
Potash
Kaolin clay
Sulphur
Aluminum
Perlite
Gypsum
Talc
Silver
Zinc
Selenium
Bentonite
Silica sand
Diatomite
Nickel
Aggregates
Titanium
Copper
Gold
Limestone
Lead

A.Y. Ku et al.


Supply risk
Economic importance
Heavy rare earth elements
Rare earth elements (2010)
Light rare earth elements
Platinum group metals (2010)
Niobium
Antimony
Niobium (2010)
Magnesium
Natural graphite
Magnesite
Tungsten
Germanium
Gallium
Fluorspar
Cobalt
Indium
Silicon metal
Tungsten (2010)
Coking coal
Beryllium
Phosphate rock
Chromium
Platinum group metals
Borates (2010)
Borates
Tantalum (2010)
Tantalum
Magnesite (2010)
Chromium (2010)

EUROPEAN INNOVATION PARTNERSHIP ON RAW MATERIALS

European Commission

European Commission > European Innovation Partnership on Raw Materials

About | Commitments | Funding Opportunities | Members | Events | Publications | News

The European Innovation Partnership (EIP) on Raw Materials

ECAS Login

The European Innovation Partnership on Raw Materials is a stakeholder platform that brings together representatives from industry, public services, academia and NGOs. Its mission is to provide high-level guidance to the European Commission, Members States and private actors on innovative approaches to the challenges related to raw materials.

The European Innovation Partnerships (EIPs) are a new approach to EU research and innovation. By bringing together actors from the entire research and innovation value chain they aim at streamlining efforts and accelerating market take-up of innovations that address key challenges for Europe.

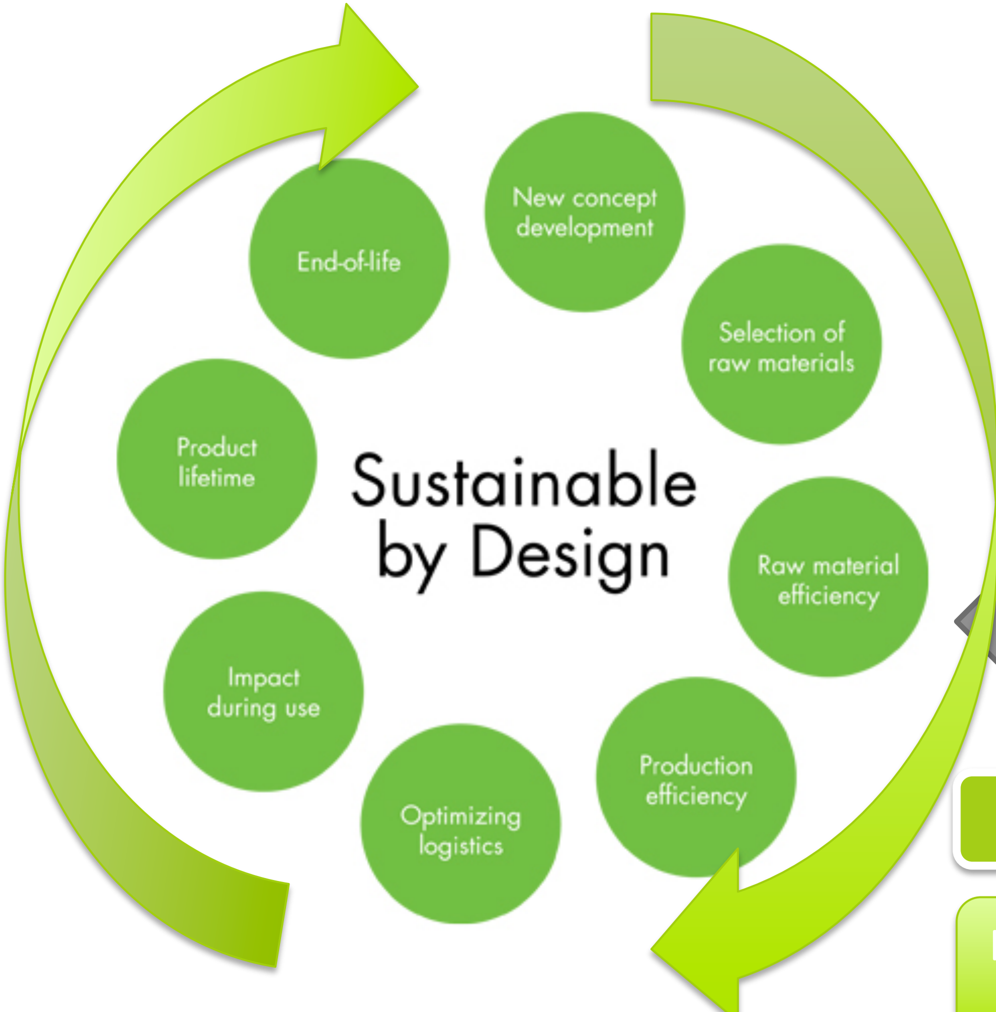
The EIP on Raw Materials' aim is to help raise industry's contribution to the EU GDP to around 20% by 2020. It will also play an important role in meeting the objectives of the European Commission flagship initiatives 'Innovation Union' and 'Resource Efficient Europe'. It will do this by ensuring the sustainable supply of raw materials to the European economy whilst increasing benefits for society as a whole.

Raw Materials - The stuff that dreams are made of

Raw Materials - The stuff that dreams are made of

Other language versions: EN DE FR ES IT PL RO

A CHANGE OF VIEW IN VALUE CHAINS (N-VC / RM-VC)



SUBSTITUTION (TRANSVERSAL CONCEPT)

FATE OF A CRM

EXTRACT/ MINE	RECYCLE	MANAGEMENT / USE

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1. Printed devices
P1-1.Printed metal
P1-3. Printed organic electronics
P1-9. Printed power supply
P1-32. Printed ceramics: TCO
P1-33. Printed ceramics: new P1-generation of Lab-on-Chip
P1-34. Printed ceramics: Integrated photonics
P1-35. Printed ceramics: Other applications
P1.36. Printed inky (at low temperature and on low cost materials e.g polymers and paper)

2. 3D Printed components
P1-12.3D printed Nano plastics (smart surface)
P1-13.3D printed Polymeric microoptics
P1-14.3D printed Hybrid optics (LED&lightning)
P1-23.3D printed Photonic wirebonds
P1-24.3D printed microparts
P1-27.3D printed Polym. microfluidic MEMS (filters)
P1-28.3D printed Polym. microfluidic MEMS (sensors)
P1-29.3D printed Polym. microfluidic MEMS (multi-use on chip)

3. OLED
P1-6.OLED- ligthing
P1-7.OLED- screen

4. MEMS
P1-5.MEMS
P1-11.Lab on chip
P1-31.Non mainstream MEMS

5. Injection moulding Tech
P1-15.Injection molded Nano plastics
P1-16.Injection molding (polimeric comp.)
P1-19.Develop of injection molding processes
P1-20.Injection molding (micro & nano plastics)

6. Micro, nano & bio materials
P1-10.Plastic consumable biotech
P1-17.micro and nano transparent polymers
P1-21.nanostructure inorganic

7. Electronics
P1-2.Integrated Circuits
P1-8.Personalized electronics

8. Anti-counterfeiting tags
P1-4.Anti-counterfeiting tags

9. Customer specific packaging solutions
P1-18.Customer specific packaging solutions

10. Optical photonics integrated on Si
P1-22.Optical photonics integrated on Si

11. Plasmonic devices
P1-25.Plasmonic devices

12. Products on 2nd hand prod. Machinery
P1-26.Products on 2nd hand prod. Machinery

13. CMOS-fab forbidden materials
P1-30. CMOS-fab forbidden materials

1. Nanostructured surfaces
P2-1. Nanostructured surfaces for production of clean energy
P2-3. Nanostructured surfaces with increased selectivity towards trace contaminants for water management
P2-4. Nanostructured surfaces with antimicrobial, antiviral, biocompatible, anti-adhesive properties for biomedical applications

2. Photocalysts
P2-2. Photocatalysts for water and indoor and outdoor air purification

3. Nanocoatings
P2-5. Multifunctional nanocoatings with improved mechanical, electrical, thermal, barrier and chemical properties
P2-6. Self-healing, self-cleaning, high-gloss, anti-scratching nanocoatings
P2-7. Nanostructured coatings for thermal management
P2-8. Anti-pollutant nanocoatings for protection of heritage monuments and buildings
P2-9. Nanocoatings for mechanically enhanced surfaces
P2-10. Nanocoatings with super hydrophobic surface properties
P2-11. Nanocoatings with enhanced surface water condensation properties for moisture collection
P2-12. Nanocoatings with corrosion-resistant and anti-fouling properties for protection of liquid and gas handling equipment and pipelines
P2-13. Nanocoatings for the garment industry with stain- resistant, anti-odor, anti-microbial, conducting, water repellent, etc. properties

4. Nanopigments
P2-14. Nanopigments with increased luminocity and long after g low for safety applications (e.g., safety signs, safety-way guidance systems for office buildings, underground stations, tunnels, etc.)

1. Multifunctional materials with embedded electronics
P4-1.Multifunctional materials with embedded sensing/actuation functions
P4-8.Multifunctional materials with embedded electronics

2. Materials with customized properties
P4-2.Materials with self healing/anti scratch properties
P4-3.Fire resistant materials
P4-4.Materials with customized thermal/electrical conductivity properties
P4-7.Materials with anti corrosion properties
P4-16 Lightweight materials with increasing resistance to the abrasive particles (sand, volcanic dust, etc) in different weather conditions

3. Lightweight materials for engines
P4-5.Lightweight batteries including their packaging
P4-6.Lightweight materials for engines

4. Bio-based materials for sandwich panels
P4-9.Bio-based materials for sandwich panels

5. Nanocomposite substances
P4-10.Nanocomposite coatings providing friction/wear reduction for the energy sector
P4-11.Bulk nanocomposites for heat recovery
P4-12.Nanocomposite based fuels/ nanocomposite additives with enhanced chemical to thermal energy conversion properties

6. Low viscosity oils
P4-13. Low viscosity oils (nanofluids)

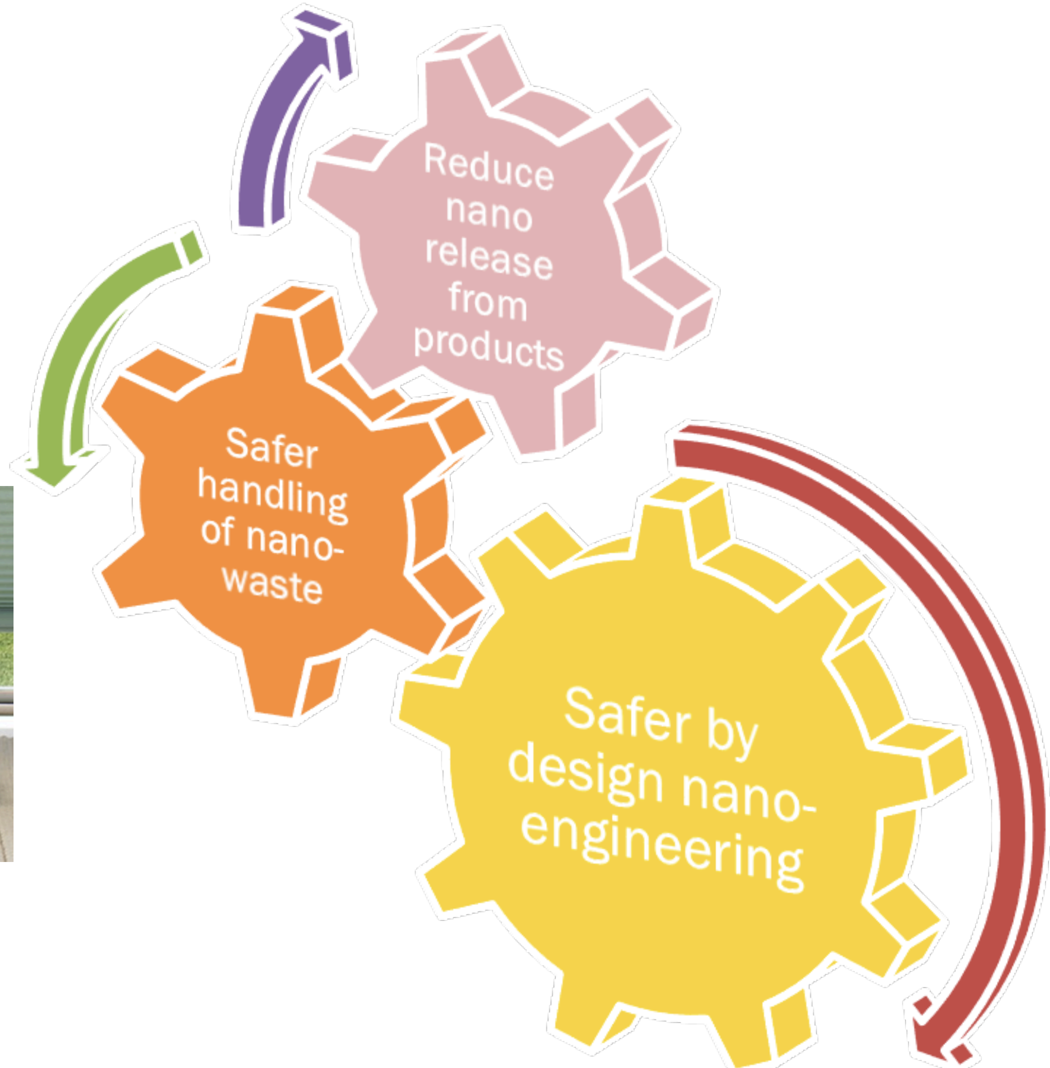
7. Materials with nanostructured surfaces
P4-14. Materials with nanostructured surfaces

8. MOFs
P4-15. Metal-Organic Frameworks (MOFs)

NANOfutures

Introduce CRMs transversal concept in the EU nanotechnology VC roadmap

UNIR EL ECODISEÑO A LA NANOSEGURIDAD (SEGURO POR DISEÑO) PARA ASEGURAR TODO EL CICLO DE VIDA



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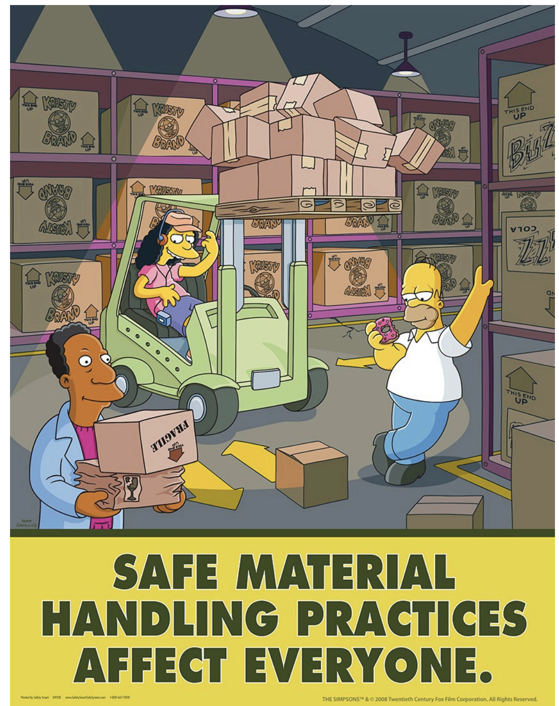
NEED OF NEW MATERIALS FOR THE FUTURE AND TO ANSWER TO EXTREME CONDITIONS NEEDS



DESIGN MATERIALS THINKING ON EFFICIENCY USE OF RESOURCES SAFETY AND SUSTAINABILITY

WHY ARE YOU GOING TO THROUGH IT AWAY IF YOU CAN RECYCLE IT

¡Gracias!

#conama2018

Thank you for your attention!