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Developments in nanotechnology, achieved through the EU-funded IP NANOKER project, mean that new multifunctional materials can be manufactured at competitive prices. This has the potential to transform industries ranging from medicine to aeronautics.

Superior hip, knee and dental implants, a new generation of transparent airplane windows and more durable coatings for automotive engines are just some of the products made possible – and cheaper – by the EU-funded IP NANOKER project. Many of these materials are now heading to market, boosting Europe’s competitiveness and creating jobs.

## **Super hard solutions**

Launched back in 2005, the four-year project set out to build upon Europe’s expertise and knowledge in nanoceramics and nanocomposites.

Nanocomposites entirely made up of ceramic and metallic nanoscale particles – particles that are usually between 1 and 100 nanometres in size – are a broad new class of engineered materials that combine excellent mechanical performance with critical functionalities such as transparency, biocompatibility, and wear resistance.

These materials offer improvements over conventional materials. For some advanced optical applications – such as windows for aircraft – glass is too brittle. Nanoceramics offer both transparency and toughness, and thanks to IP NANOKER, can now be manufactured at a significantly reduced cost.

Indeed, one of the most important outcomes of IP NANOKER has been the development of new dense nanostructured materials as hard as diamond. The fabrication of these super hard materials require extreme conditions of high temperature and pressure, which is why IP NANOKER project partners developed a customised Spark Plasma Sintering machine.

*“This new equipment is the largest in the world (12 metres high, 6 metres wide and 5 metres deep), and features a pressing force up to 400 tonnes and will allow the fabrication of near-net shaped*

*products up to 400mm in diameter”, explains project coordinator Ramon Torrecillas from Spain’s Council for Scientific Research (CSIC).*

## **A bright future**

The project promises to have a long-lasting impact. In 2013, some former IP NANOKER partners launched a public-private initiative with the objective of bridging the gap between research and industry and boosting the industrial application of Spark Plasma Sintering in the development of nanostructured multifunctional materials.

Potential new nanomaterial-based products hitting the market soon include ultra-hard cutting and mining tools, tough ceramic armour and mirrors for space telescopes.

*“Another positive result arising from IP NANOKER was the launch in 2011 of Nanoker Research, a Spanish spin-off company,” says Prof Torrecillas. “This company was formed by researchers from two of the project partners, CSIC and Cerámica Industrial Montgatina, and currently employs 19 people.”*

IP NANOKER was also instrumental in creating the Nanomaterials and Nanotechnology Research Centre (CINN) in Spain, a joint initiative of the CSIC, the University of Oviedo and the Regional Government of Asturias.

As a result of its economic and societal impact, IP NANOKER was selected as project finalist in two European project competitions: Industrial Technologies 2012 and Euronanoforum 2013.

Some three years after its completion, the positive effects of the project are still being felt. Prof Torrecillas is delighted with the results, and argues that only a pan-European project could have achieved such ambitious goals.

*“As an industry-led project, IP NANOKER provided a suitable framework for research on top-end applications that require not only costly technologies but also very specific know-how,” he says. “Thus, bringing together the best European experts in materials science, chemistry, physics and engineering and focusing the work of these multidisciplinary teams on specific applications, was the only way to face the project challenges.”*

### **See also:**

[CORDIS](#) [2]

### **Project:**

Structural ceramic nanocomposites for top-end functional applications

### **Project Acronym:**

IP NANOKER

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