



The material of the future

An Italian-led European consortium is studying the characteristics and prospects of gallium nitride (GaN)

It's called gallium nitride - GaN, in jargon. - and promises to be one of the key materials of the near future. It could soon take over from silicon carbide (SiC), another material on which a great deal of work has been done over the last few decades, but which is perhaps beginning to reach the limits of its research. The value of this material is obvious: it can be used to create technologies which can considerably reduce the size of power generation machines. This is why the Distretto Tecnologico Sicilia Micro e Nano Sistemi, already leader of a European project on SiC, is now coordinating 'GaN4AP', an H2020 investee company (with 36 partners plus 9 affiliates) that will explore the prospects and qualities of the new material.

"I am excited about the partnership of the new project: research institutions, medium-sized and large companies, and end-users building up the 'value chain', on a continental scale, in the ambitious research challenge being carried out by the Japanese and Americans," emphasises Engineer Leoluca Liggio, the project's leader. In operational terms, four parallel paths are being worked on simultaneously. "The first has to deliver results quickly: we started from the state-of-the-art in GaN research to produce converters that can be lighter, more



efficient and cheaper than SiC converters,' explains Professor Gaudenzio Meneghesso of the University of Padua's Department of Information Engineering, the project's scientific coordinator. "Basically, we've taken the best devices already on the market and we're trying to develop them in a new and comprehensive way, something no one has worked on yet." Two other GaN4AP outputs have less urgent deadlines. On the one hand, an additional semiconductor element, scandium, will be introduced to create more high-performance devices. On the other hand, instead of the current devices that develop laterally, the aim is to build them vertically, because they can provide more power. Finally, there is the fourth output, which is the most innovative one yet. "We are aiming for electronics integrated with GaN devices - concludes Meneghesso - no longer dealing with individual transistors, but rather compacting them to create a monolithic integration. We want to create an integrated circuit with GaN, which will be of great use especially for the automotive sector: in terms of size, performance and compactness, it will be an ideal device for the new electric cars". ■

