

**Decore: A New European Project
Aiming At Innovative DEFCs
Operating At Intermediate
Temperatures**

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The project called Direct ElectroChemical Oxidation Reaction of Ethanol: optimization of the catalyst/support assembly for high temperature operation (DECORE) has started its activity from January 2013 (four years project).

It is a *Small-scale (7 partners in the Consortium) Cooperative project financed by the European Commission within the call: NMP.2012.1.1-1: Rational design of nano-catalysts for sustainable energy production based on fundamental understanding.*

The main general goal of *DECORE* is to achieve the fundamental knowledge needed for the development of a fuel cell (FC) electrode in acidic ambient, which can operate efficiently (both in terms of activity and selectivity) as the anode of a direct ethanol (EOH) FC (DEFC) in the temperature range between 150-200 °C (*intermediate-T*). Such a technology is still lacking in the market. The choice for EOH as an alternative energy source is well founded on the abundance of bioethanol, and on the relatively simpler storage and use with respect to other energy carriers. The *intermediate-T* is required for an efficient and selective total conversion of EOH to CO₂, so exploiting the maximum number of electrons in the DEFC. *DECORE* will explore the use of fully innovative supports (based on oxycarbides) and nano-catalysts (based on metal carbides, MC_x), which have never been tested in literature as anodes for DEFCs. The new supports are expected to be more durable than standard carbon supports at the targeted temperature. The innovative nano-catalysts would be noble-metal free, so reducing Europe's reliance on imported precious metals. To tailor the needed materials, the active role of the support and nano-catalyst will be studied at atomic level. The Consortium is composed by 5 academic groups (University of Padova, Coordinator, Technical University of München, University of Milano-Bicocca, University of Copenhagen, University of Laguna, Tenerife), one group from Consiglio Nazionale delle Ricerche (CNR-ICCOM) and one industrial partner (Elcomax GmbH). Surface scientists, electrochemists and theoreticians will cooperate to try to develop a new *knowledge-based* technology.

Demonstrating an activity of such nano-catalyst/support assembly at *intermediate-T* would open a novel route where DEFCs with strongly reduced production costs would have an impact on a fast industrialisation. The power range for the envisioned application is of the order of hundreds of Watts, i.e. the so called distributed generation, having an impact for devices such as weather stations, medical devices, signal units, auxiliary power units, gas sensors and security cameras. By the end of the project, a bench-top single DEFC operating at *intermediate-T* will be built and tested.