CHEMISTRY

Production of reactive vacancies and metal single atoms in carbons materials

Metal species with different size (single atoms, nanoclusters, and nanoparticles) show different catalytic behavior for various heterogeneous catalytic reactions. In particular, single atom catalysis (SAC) offers great potential for achieving high activity and selectivity. The formation of vacancies over carbon materials is highly desired as they are potentially very interesting to stabilize metal single atoms or to confer specific properties. The main challenges concern the mass production and scale-up.

DESCRIPTION*

This technology consists of a simple, straightforward chemical and up-scalable method of creation of vacancies in carbon materials and its direct utilization for the production of single atom dispersed materials. The different steps are :

- Oxidizing treatment of a carbon material that induces the formation of different types of surface oxygen function, in particular carboxylic groups
- Heat treatment under inert gas in order to obtain reactive vacancies
- Reaction with a metallic precursor in a solvent under inert gas

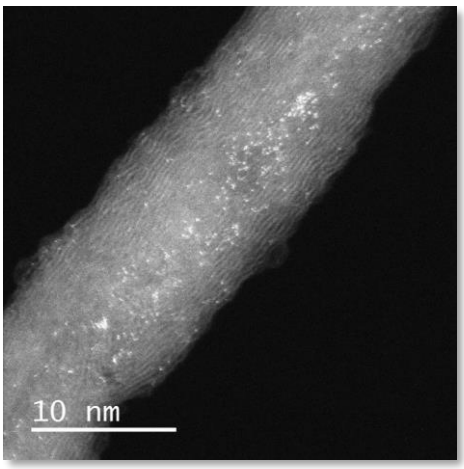

Photo: ©LCC

TECHNICAL SPECIFICATIONS

Metallic loading in the final carbon material	0.01 à 10% weight
Metal size	Only isolated metal single atom or Both metal single atoms and nanoparticles in a controlled way: $10 < \frac{SAC}{nanoparticles} < 200$

COMPETITIVE ADVANTAGES

- Up-scalable method
- Production of carbon materials containing significant amounts of reactive vacancies
- Allows the production of isolated and stable metal single atoms on carbon materials with important metal loading (between 0.01 to 10% weight)
- Allows the production of both metal single atoms and nanoparticles in a controlled way

APPLICATIONS

- Catalysis
- Polymers
- Magnetic applications
- Biosensors

INTELLECTUAL PROPERTY

- Patent pending

DEVELOPMENT STAGE

- Technology validated at lab level

1 2 3 **4** 5 6 7 8 9

LABORATORY

LCC

CONTACT

T. +33 (0)5 62 25 50 60
systemes@toulouse-tech-transfer.com
www.toulouse-tech-transfer.com

* Technology requiring license rights.