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Plasma deposition of catalytic thin films: experiments, modeling and applications.Pascal Brault¹¹GREMI UMR6606 CNRS-University Orleans, ORLEANS cedex2, France

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The use of plasma, whatever their mode of creation, in the field of treatment of materials (surface modifications, deposit, ...), was generalized over the last thirty years. This is largely due to the reactivity of plasma environments that generate many reactive species, ionized, excited, photons, electrons. Thus, plasmas have found technological applications in the fields of surface modification, and recently in the field of catalysis.

For economic and environmental reasons, catalytic processes require continuous improvements, which can be realized by different ways, one of them being to find new methods for preparing catalysts. Indeed the catalytic properties depend strongly on the chemical, structural, morphological characteristics of the surface of the active catalytic phase. To improve the catalytic performance, the plasma processes have been successfully applied in the preparation and regeneration of catalysts.

Various surfaces are adequate to be a catalyst support. Moreover, the crystal structure, morphology (porous nanostructured ...) are very important properties which deserve to be improved as much as possible. The advantage of plasma is to generate and control such features, particularly for deposits, but also for impregnation. Another advantage is to control the variations in composition, concentration gradients during deposition of the catalytic phase.

The plasma functionalization of surfaces, including those of powders into suspension, is also a meaningful application of plasmas in the field of catalysis.

After recalling the relevant surface morphologies in catalysis, the presentation will review the techniques used for plasma preparation of catalytic surfaces and more generally reactive surfaces with applications in the field of energy and environment.

Keywords

sputtering deposition

diffusion

fuel cells

modelling

Molecular dynamics simulations