

The consequences of air pollution and possible materials science solutions

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The diminishing reserves of fossil fuels and the rising concerns about the environment and global warming have focused attention on the possibility of making more efficient use of methanol, natural gas or higher hydrocarbons fuels. Thus, fuel cells could be an optimal choice as an electrical source, which is still under-utilized presently.

In recent years, there has been a growing interest in the reduction of air pollutant gases emitted during combustion processes in order to reduce environmental pollution and preserve the ecosystem. In particular, nitrogen oxides (NO and NO₂: NO_x), particles matter (PM), ozone released from automobiles and chemical plants, have been one of the main causes of acid rain, smog... Sensors are utilized in a variety of applications to determine the presence of such pollutant gases, e.g. reducing gases such as carbon monoxide, ammonia, methane, alcohols.

The leading technology in reducing particulate matter (PM) is the Diesel Particulate Filter (DPF). This wall-flow type filter, based on monolithic substrate with alternative plugged inlets and outlets channels, exhibit minimum backpressure, excellent PM filtration efficiency and a large filtration area in a relative small volume. Immediate oxidation of the trapped Particulate Matter is called the regeneration process.

It will be presented a review of the state of the art in the materials science field for those technologies taking into account the operation requirements and the present challenges.

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