

Adsorbent materials for hydrogen storage

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A research team from the Public University of Navarra has started a study of the design and development of absorbent materials that enable the storage of hydrogen, a clean fuel that can be used as an alternative to those derived from fossil fuels, such as petrol and diesel. The storage of this element is, in fact, a key process in the change over from internal combustion engines – contaminating and not very efficient, to cars with hydrogen fuel cells.

The project, entitled, Development of materials for storage of hydrogen by means of physical adsorption.

At present, hydrogen production "is not a problem". For some years now, hydrogen has been obtained by means of catalytic reforming or by the electrolysis of water. However, the question hanging over the use of hydrogen as a fuel is its generation or storage in the quantities required for a means of transport and without it being dangerous – as we are dealing with a highly inflammable gas. Under normal conditions hydrogen is in a gaseous state and thus has to be kept under high pressure or, if we wish to reduce the pressure, the storage temperature has to be lowered. These two circumstances give rise to technological difficulties, apart from the added safety ones.

There are various ways to store hydrogen: pressurised, liquid, absorbed into metals (as hydrides) and physisorbed in suitable materials. This last method, involving the "physical adsorption onto porous materials", is what is being developed in this current research project, the end of which is projected for next year. In concrete, the study is being carried

out employing nanoporous materials the pore size of which is in the range of 0 to 10^{-6} metres.

The mentioned research team has commenced work on three families of materials: activated carbons, zeolites and stacked clays. These materials fulfil four requisites: they have mechanical resistance and are safe, apart from being light and cheap.

Storage based on physisorption provides a potentially higher energy efficiency than the rest of the mentioned storage options, given that the hydrogen is retained at a low temperature and 100% of the hydrogen adsorbed can be recovered. The low boiling point of hydrogen (-253°C) makes it necessary to employ temperatures of about -196°C in order to attain sufficient amount of adsorbed hydrogen. The freeing of the physisorbed hydrogen can be, moreover, a rapid process and can be carried out easily with small changes of pressure and/or temperature.

Source: [Elhuyar Fundazioa](#)

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