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Storing hydrogen, by enhancing diamond powder properties with CaF_2 and KF for use in fuel cells

Franklyn Colmenares and Mark Prelas

Whaaaat!!!!!!!!!!!! Hydrogen as a fuel? Yes just like you read it, hydrogen is becoming the best alternative to change our economical dependence on fossil fuels. Today fossil fuels are the main source of energy in the world, covering over 80% of these needs, and most of this fuel is used in transportation systems. Hydrogen covers about 75% of matter in the universe, being by far one of the most abundant elements; it is also a very simple atom that consists of an electron and proton. Since hydrogen can easily provide energy; a technology called fuel cells has been developed. A fuel cell is like a battery that instead of using electricity to recharge itself, it uses hydrogen. In the fuel cell industry, one of the main problems is storing hydrogen in a safe way and extracting it economically. Gaseous hydrogen requires high pressures which could be very dangerous in case of a collision. The success of hydrogen use depends largely on the development of an efficient storage and release method. In an effort to develop a better hydrogen storage system for fuel cells technology this research investigates the use of 99% pure diamond powder for storing hydrogen. Mixing this powder with a calcium fluoride and potassium fluoride compound in its solid form and treating the surface of the powder with hydrogen plasma, modifies the surface of the diamond. After some filtration through distilled water and drying, the modified diamond is treated with hydrogen. We expect hydrogen to be attracted to the diamond powder surface in higher quantities due to the CaF_2 and KF treatment. Due to the large surface area of diamond nanopowder and the electronegative terminal bonds of the fluorine particles on the structure's surface, to the method shows promise in storing high densities of hydrogen.