Türkan Kopaç, J Aeronaut Aerospace Eng 2018, Volume 7
DOI: 10.4172/2168-9792-C1-022

Materials for hydrogen storage applications

Türkan Kopaç
Bülent Ecevit University, Turkey

The lack of fossil fuel supplies and the environmental concerns related with burning fossil fuels have created the need to look for renewable and cleaner energy resources. Hydrogen has been regarded as an ideal energy carrier, because of higher heat of combustion than gasoline, and emission of cleaner combustion by-products. Hydrogen can be stored by applying various storage techniques, such as compressing, liquefying at very low temperature, adsorption in porous solids, forming metallic and complex hydrides.

Figure 1: Hydrogen storage techniques

Hydrogen storage systems are the subject of several studies searching for the appropriate materials for the applications, and each system has its own advantages and disadvantages. A safe and effective hydrogen storage technique is important for a possible application. Among the various hydrogen storage techniques, adsorption of hydrogen on porous solids has many advantages over the other systems. Porous solids such as, activated carbons, carbon nanostructures, metal–organic frameworks (MOFs), metal-carbon composites are some of the examples studied for hydrogen storage applications. The results of the studies carried out by various materials have shown that the hydrogen storage properties mainly depend on the surface and the structural characteristics of the sorbent materials. Therefore, efforts have been given towards the studies for enhancing the surface characteristics, such as surface area, pore volume of the sorbent material, as well as the interactions between the hydrogen and the surface of the materials.

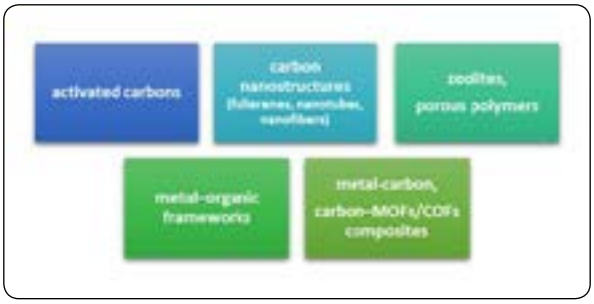

Figure 2: Materials for hydrogen sorption

In recent years, there exists a large number of publications on hydrogen storage applications in literature indicating a great progress in this field. In this contribution an overview of hydrogen storage applications, new materials for hydrogen sorption, limitations, advantages, and current trends will be discussed.

Recent Publications

1. Kopac T, Kırca Y, Toprak A (2017) Synthesis and characterization of KOH/Boron modified activated carbons from coal and their hydrogen sorption characteristics. International Journal of Hydrogen Energy 42: 23606-23616.
2. Kopac T, Toprak A (2009) Hydrogen sorption characteristics of activated carbons produced from Zonguldak region coals by physical and chemical activations. Korean Journal of Chemical Engineering 26:1700-1705.
3. Toprak A, Kopac T (2011) Surface and hydrogen sorption characteristics of various activated carbons developed from Rat coal mine (Zonguldak) and antracite. Chinese Journal of Chemical Engineering 19:931-937.
4. Kopac T, Karaarslan T (2007) H2, He and Ar sorption on arc-produced cathode deposit consisting of multiwalled carbon nanotubes-graphitic and diamond-like carbon. International Journal of Hydrogen Energy 32:3990-3997.
5. Kocabas S, Kopac T, Dogu G, Dogu T (2008) Effect of thermal treatments and palladium loading on hydrogen sorption characteristics of single walled carbon nanotube. International Journal of Hydrogen Energy 33:1693-1699.

Biography

Türkan Kopaç received her B.Sc (1983) and M.Sc degrees (1985) in Chemical Engineering from the Middle East Technical University, and Ph.D in Chemical Engineering (1992) from Gazi University, Ankara Turkey. Her research activities focus on adsorption, adsorbent development/characterization, nanostructures, protein adsorption/surface interactions with nanomaterials, dye adsorption, activated carbon from coal, environmental applications, MOF structures, hydrogen storage, methane, carbon dioxide adsorption. She is currently Professor at the Department of Chemistry, Bülent Ecevit University, Zonguldak, Turkey. She also served as the Vice Dean (1999-2002), then Dean of the Faculty of Arts and Sciences (2002-2008), and Vice Rector (2008-2010) of Bülent Ecevit University, Zonguldak, Turkey. She has been awarded "Assoc. Prof. Dr. Fahrettin Can Success in Managership Award" (2010) from the Middle East Technical University, Ankara.

turkankopac@yahoo.com

Notes: