


RESEARCH ARTICLE

# H<sub>2</sub> storage using Zr-CMK-3 developed by a new synthesis method

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## Summary

One of the biggest problems in using hydrogen as an alternative fuel is that its storage must be safe and portable. This work addresses a new direct synthesis technique used to obtain a novel mesoporous carbon (CMK-3) modified with zirconium oxide. This novel material shows promise for hydrogen adsorption and storage application for energy harvesting. Zirconium oxide (Zr-CMK-3) material is achieved through successful synthesis and characterized by XRD, SEM, Raman, BET, UV-Vis-DRS, XPS and TEM analyses. Zr-CMK-3 significantly improved H<sub>2</sub> storage performance (reaching at 77 K and 10 bar 4.6 wt%) compared to the pristine CMK-3. The novel material is favorable for H<sub>2</sub> uptake by using weak bonding (physisorption). A hydrogen uptake mechanistic approach is proposed and the role of the Zr<sup>+4</sup> cation in hydrogen adsorption is discussed.

## KEYWORDS

CMK-3, energy, H<sub>2</sub>, storage, zirconium

