

Porous silsesquioxane–imine frameworks as highly efficient adsorbents for cooperative iodine capture.

Autorzy

Mateusz Janeta

Wojciech Bury

Sławomir Szafert

Rok wydania

2018

Czasopismo

ACS Applied Materials and
Interfaces

Numer woluminu

10

Strony

19964-19973

DOI

10.1021/acsami.8b03023

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

The efficient capture and storage of radioactive iodine (^{129}I or ^{131}I), which can be formed during nuclear energy generation or nuclear waste storage, is of paramount importance. Herein, we present highly efficient aerogels for reversible iodine capture, namely, porous silsesquioxane-imine frameworks (PSIFs), constructed by condensation of octa(3-aminopropyl)silsesquioxane cage compd. and selected multitopic aldehydes. The resulting PSIFs are permanently porous (Brunauer-Emmet-Teller surface areas up to $574\text{ m}^2/\text{g}$), thermally stable, and present a combination of micro-, meso-, and macropores in their structures. The presence of a large no. of imine functional groups in combination with silsesquioxane cores results in extremely high I_2 affinity with uptake capacities up to 485 wt %, which is the highest reported to date. Porous properties can be controlled by the strut length and rigidity of linkers. In addn., PSIF-1a could be recycled at least four times while maintaining 94% I_2 uptake capacity. Kinetic studies of I_2 desorption show two strong binding sites with apparent activation energies of 77.0 and 89.0 kJ/mol. These energies are considerably higher than the enthalpy of sublimation of bulk I_2 .

Słowa kluczowe

microporous polymer, iodine capture, gas storage, porosity, aerogel, imine, silsesquioxane

Adres publiczny

<http://doi.org/10.1021/acsami.8b03023>

Strona internetowa wydawcy

<https://www.acs.org/content/acs/en.html>