



Hybrid inorganic–organic polyhedral oligomeric silsesquioxane-based poly(1-haloacetylene)s: thermal, solid-state polymerization

Autorzy

Marta Cieplucha

Mateusz Janeta

Sławomir Szafert

Rok wydania

2025

Czasopismo

Materials Chemistry Frontiers

Numer woluminu

9

Strony

3034-3043

DOI

10.1039/d5qm00583c

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

We present the synthesis and comprehensive characterization of a new class of hybrid inorganic–organic materials: polyhedral oligomeric silsesquioxane (POSS) cages functionalized with 1-haloacetylene groups (Cl, Br, I). These building blocks undergo a unique, catalyst-free, solid-state thermal polymerization. This process results in highly cross-linked poly(1-haloacetylene) networks. The resulting polymers—polyPOSS-C2Cl, polyPOSS-C2Br, and polyPOSS-C2I—exhibit direct optical band gaps of 2.79, 2.74, and 2.38 eV, respectively, and maintain the structural integrity of the POSS core, as confirmed by solid-state NMR (^{13}C , ^{15}N , and ^{29}Si), DRIFT, Raman, and PXRD analyses. Kinetic studies indicate pseudo-second-order polymerization with activation energies between 179 and 217 kJ/mol. These materials are completely insoluble in common solvents and thermally stable up to 309°C. Their robust structure, high thermal resistance, and semiconducting properties highlight their potential for advanced optoelectronic applications.

Adres publiczny

<http://dx.doi.org/10.1039/d5qm00583c>

Strona internetowa wydawcy

<https://www.rsc.org/>