



A New Approach for The Synthesis of Ceramic Materials

Yusuf Nur

Department of Chemistry, Mustafa Kemal University, Antakya, Turkey

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Corresponding author:

Yusuf Nur

E-mail:

ynur2005@gmail.com

Tel:+905337483548

Abstract: Polycarbynes and polysilynes have previously been shown to be polymeric precursors to diamond, diamond-like carbon (DLC) and silicon carbide production. The most important properties of these polymers are to form tough, hard-wearing ceramic materials with high thermal stabilities upon moderate heating. Poly(methyl silyne) (PMSi) and polyhydridocarbyne (PHC) are the most known pre-ceramic polymers. PHC forms diamond and DLC, while PMSi can be easily converted to SiC upon pyrolysis. Poly(silyne-co-carbyne) (PSC) simply forms silicon carbide without requiring the addition of more carbon species and a catalyst since it already contains silicon and organic carbon on its backbone. Here, we report a simple method for producing silicon carbide using PSC, which contains both silyne and carbene on its backbone. PSC is simply synthesized using trichloro(dichloro methyl) silane (TCS), electricity, a solvent and an electrolyte. Coating of PSC on any surface is very easy and cheap due to the solubility of it in common organic solvents. UV/Vis spectroscopy, ¹H-NMR and GPC analyses were shown the structure of PSC. Ceramic film was obtained by sintering of the polymer at 1000, 750 or 500 °C depending on sinter atmosphere whether being inert or air. This study was supported by TUBITAK with project number 211T108).

Sažetak

Polikarbini i polisilani su se prethodno pokazali kao polimerni prekursori dijamanta, karbona sa karakteristikama dijamanta (DLC) i silicij karbid produkata. Najvažnija svojstva tih polimera su da nakon umjerenog grijanja, formiraju tvrd, izdržljiv keramičkih materijala s visokom toplinskom stabilnošću. Poli (metil siline) (PMSi) i polihidridokarbina (PHC) su najpoznatiji početni keramički polimeri. PHC formira dijamant i DLC, dok PMSi se može lako pretvoriti u SiC nakon pirolize. Poli (siline -CO - carbine) (PSC) jednostavno oblikuje silicijev karbid bez potrebe za dodavanjem novih atoma i katalizatora jer već sadrži silikon i organski ugljika u svom kosturu. Ovdje predstavljamo jednostavnu metodu za proizvodnju silicij karbida korištenjem PSC, koji sadrži i siline i karbin u svojoj strukturi. PSC se jednostavno sintetizira iz trihaloro (dihloro metil) silana (TCS) u prisustvu otapala i elektrolita. Premazivanje PSC na bilo koju površinu je vrlo jednostavno i jeftino, zbog rastvorljivosti u uobičajenim organskim otapalima. UV / Vis spektroskopija, ¹H - NMR i GPC-a analize su korištene u analizi strukture PSC. Keramički film je dobiven sinterovanjem polimera na 1000, 750 ili 500 °C, ovisno o atmosferi (inertna ili zrak).

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