Accepted Manuscript

Enhanced thermal conductivity of photopolymerizable composites using surface modified hexagonal boron nitride fillers

Nir Goldin, Hanna Dodiuk, Dan Lewitus

PII: S0266-3538(17)30528-6

DOI: 10.1016/j.compscitech.2017.09.001

Reference: CSTE 6890

To appear in: *Composites Science and Technology*

Received Date: 11 March 2017

Revised Date: 28 August 2017

Accepted Date: 2 September 2017

Please cite this article as: Goldin N, Dodiuk H, Lewitus D, Enhanced thermal conductivity of photopolymerizable composites using surface modified hexagonal boron nitride fillers, *Composites Science and Technology* (2017), doi: 10.1016/j.compscitech.2017.09.001.

Enhanced thermal conductivity of photopolymerizable composites using surface modified hexagonal boron nitride fillers.

Nir Goldin[a], Hanna Dodiuk[a], and Dan Lewitus[a]*

Author and affiliations:

[a] Department of Polymers and Plastics Engineering, Shenkar - Engineering. Art. Design, Ramat-Gan, Israel

*Corresponding author

Abstract:

The interest in photocurable polymers has risen greatly in the past few years, in part due to the additive manufacturing revolution. Still, their widespread use is hindered by various inherent physical properties, such as thermal insulation. This work is aimed towards the development of photopolymerizable polymer composites that are thermally conductive, while maintaining their photocurable characteristics. We developed photocurable acrylic-based photopolymer composites with hexagonal boron nitride (hBN) using the following method: pristine hBN underwent two chemical surface modifications, was added to the monomers, and the mixture then underwent radiation curing. The success of the synthesis was verified in two ways: FTIR and XPS analyses in which the formation of carbonyl groups at the surface of the treated hBN was tracked, as well as tracking the increase in the homogeneity of the pre-polymerized solution. The addition of a reaction accelerator (o-benzoic sulfimide) to the photoinitiator system allowed for an increase of conversion percentage from ~60% to ~95%, even with high hBN loadings. Thermal conductivity (measured via modulated differential scanning calorimetry (MDSC)) increased with respect to hBN content by more than 300% when using 35wt% hBN. Young's modulus and viscosity increased with hBN content, while