Accepted Manuscript

Improvement of mechanical properties by a polydopamine interface in highly filled hierarchical composites of titanium dioxide particles and poly(vinyl butyral)

P. Georgopanos, E. Eichner, V. Filiz, U.A. Handge, G.A. Schneider, S. Heinrich, V. Abetz

PII: S0266-3538(17)30239-7

DOI: 10.1016/j.compscitech.2017.04.017

Reference: CSTE 6747

To appear in: *Composites Science and Technology*

Received Date: 30 January 2017

Revised Date: 13 April 2017

Accepted Date: 13 April 2017

Please cite this article as: Georgopanos P, Eichner E, Filiz V, Handge UA, Schneider GA, Heinrich S, Abetz V, Improvement of mechanical properties by a polydopamine interface in highly filled hierarchical composites of titanium dioxide particles and poly(vinyl butyral), *Composites Science and Technology* (2017), doi: 10.1016/j.compscitech.2017.04.017.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Improvement of Mechanical Properties by a Polydopamine Interface in Highly Filled Hierarchical Composites of Titanium Dioxide Particles and Poly(vinyl butyral)

P. Georgopanos,[1†] E. Eichner,[2†] V. Filiz,[1] U.A. Handge,[1] G.A. Schneider,[3] S. Heinrich,[2] V. Abetz[1, 4*]

[1]*Helmholtz-Zentrum Geesthacht, Institute of Polymer Research, Max-Planck-Strasse 1, 21502 Geesthacht, Germany*

[2]*Hamburg University of Technology, Institute of Solids Process Engineering and Particle Technology, Denickestrasse 15, 21073 Hamburg, Germany*

[3]*Hamburg University of Technology, Institute of Advanced Ceramics, Denickestrasse 15, 21073 Hamburg, Germany*

[4]*University of Hamburg, Institute of Physical Chemistry, Martin-Luther-King-Platz 6, 20146 Hamburg, Germany*

[*] Corresponding author: volker.abetz@hzg.de

[†] The authors contributed equally.

Abstract: In this work, the preparation and properties of hierarchical composites of titanium dioxide (TiO_2) particles (rutile modification) and poly(vinyl butyral) (PVB) are discussed. The volume fraction of the ceramic particles was approximately 60%. Two types of composites with different fillers were examined, i.e. TiO_2 particles with and without a thin coating of polydopamine (PDA). A variety of characterization methods was applied in order to analyze the properties of the particles and the composites. Infrared spectroscopy is used to verify the functionalization of the particles with a thin polydopamine layer. Thermal analysis provides information on the thermal stability and the degree of functionalization of the coated particles and the composites. Scanning electron microscopy investigations reveal that the functionalized TiO_2 particles with PDA form larger agglomerates which enable the coating of the TiO_2 particles with PVB *via* the spouted bed technique. Nanoindentation experiments show that the final hierarchical composite material with the use of non-coated TiO_2 particles exhibits a hardness of 0.75 ± 0.04 GPa and a Young's modulus of 29.5 ± 1.0 GPa. The composites containing polydopamine coated TiO_2 particles show an increase of

Download English Version:

https://daneshyari.com/en/article/5022097

Download Persian Version:

https://daneshyari.com/article/5022097

Daneshyari.com