

NANO-SCALE MORPHOLOGICAL ANALYSIS OF GRAPHENE – RUBBER COMPOSITES BY 3D TRANSMISSION ELECTRON MICROSCOPY

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ABSTRACT

For this study a solution styrene butadiene rubber (S-SBR) matrix filled with 35phr carbon black and 5phr graphene nano platelets was used.

In this poster three-dimensional transmission electron microscopy (3D-TEM) is exploited to characterize a soft graphene based nano-composites structure and the constituted morphology in a qualitative way. The reconstruction of the two dimensional slides into a three dimensional tomographic image is a powerful tool, when the images of the nano-object are reflected into a quasi-distinguishable object due to superposition effect. By this technique it is possible to mark the contour area of the nano-sized object inside soft rubber matrix. To extract information about the filler network, clustering process of the fillers or the existence of single or multiple graphene sheets, a solution polymerised styrene butadiene rubber was selected as a soft matrix which was filled with carbon black (CB) and graphene nano-platelets (GnP). The existence of single graphene sheets was detected by this 3D TEM especially, when the rubber matrix exists in a complex morphology arisen from filler-filler networks in all spatial dimensions.

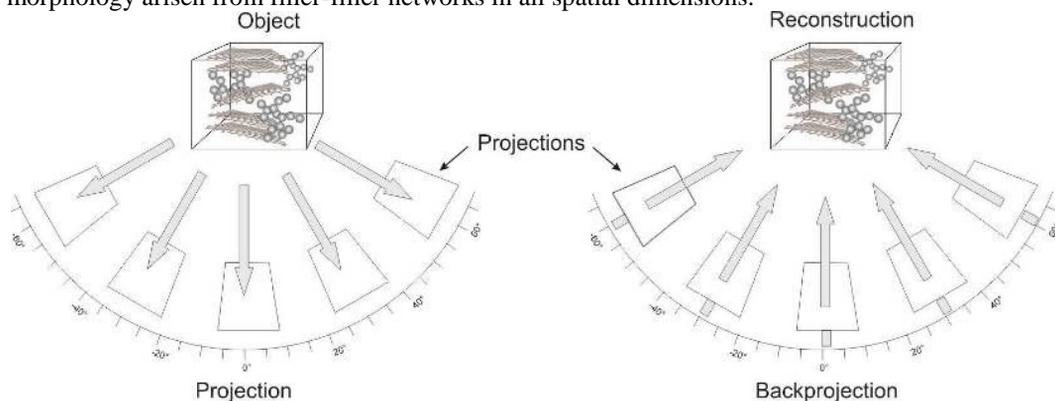


Fig. 1: Schematic depiction of 3D-TEM tomography by reconstruction via backprojection

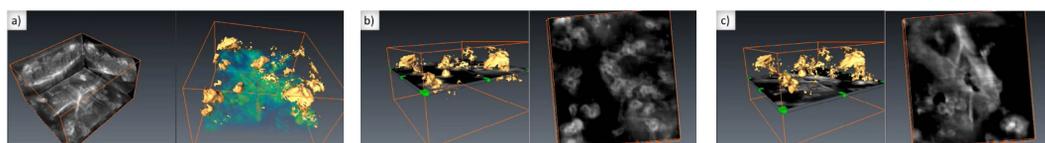


Fig. 2: Visualization of 3D reconstruction of SSBR filled with 35 phr CB and 5 phr GnP, yellow and green regions represent CB and GnP, respectively,

b) and c) present the resultant volume on the left side and a slice in z-direction on the right side

Acknowledgement: The authors thank the German Federal Ministry of Education and Research (BMBF) for financial support - Grant number: 03X0110B. We are also grateful to Dr. Daniel Wolf, TU Dresden, Speziallabor für Höchstauflösende Elektronenmikroskopie und Elektronenholographie Triebenbergl for the valuable support. Manfred Klüppel, Markus Möwes and Christian W. Karl, DIK Hanover are acknowledged for helpful and fruitful discussions.