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Preparation of graphene oxide reinforced sol-gel polishing film with enhanced mechanical strength

Jing Lu, Jing Zhou and **Hui Huang**
Huaqiao University, P.R. China

The semi-fixed abrasive polishing film which was based on sol-gel (SG) technology exhibited favorable machining performance in processing semiconductor power device materials. Compared to the fixed diamond abrasive tool, SG semi-fixed diamond abrasive tool could easily obtain a smooth and scratch-free surface with nanometer scale roughness due to the effect of abrasive yielding. However, the strength of SG polishing film is relatively low which restrains its further development. Graphene is a two dimensional material of carbon atoms in a hexagonal arrangement with remarkable mechanical and electrical properties, high thermal conductivity, specific surface area and good compatibility. Therefore, it is widely used in a range of applications, such as electronics, solar cells and electrochemical sensors, especially as a multifunctional nanofiller. Compared with graphene, Graphene oxide (GO) has excellent mechanical properties, favorable compatibility and solubility. In this paper, graphene oxide (GO) was used to enhance the strength of the polishing film which was fabricated from sodium alginate. The dispersing stability of the GO, microstructure and tensile strength of the polishing film have been investigated by Zetasizer, three-dimension optical microscope, FTIR spectroscopy, scanning electron microscope and electronic universal testing machine. The results revealed that diamond abrasives, sodium alginate and graphene oxide could mix with each other homogeneously and the mechanical properties of the as-prepared films were improved significantly over that of the pure SG polishing film. The tensile strength of the SG film with GO increased by 52.67%, 63.13%, 28.28% compared to sheer SG film when the concentration of GO was 0.01 wt%, 0.05 wt%, 0.10 wt%, respectively. Furthermore, the addition of graphene oxide facilitated the interfacial interaction between GO sheets and polymer matrix.

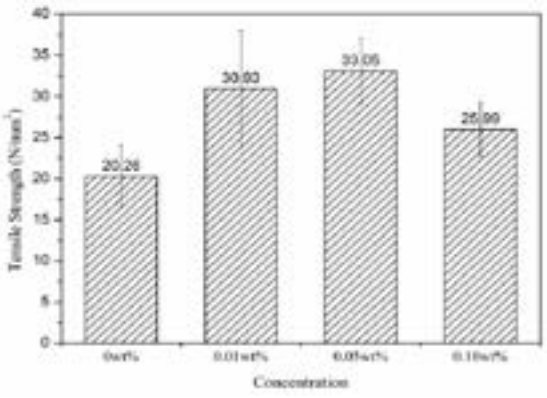

Figure1. Tensile strength of specimens with different concentration of GO

Biography

Prof. Jing Lu has her expertise in surface modification of nano carbon materials and the corresponding application fields. After got her PHD degree in Material Science, she worked in Mechanical Engineering and focused the research on ultra-precision machining of wide bandgap semiconductor. She has developed a novel method to coat diamond core with oxide shell and significantly improve the interface bonding between the abrasive and the polymer marix. The related achievement have been published in Nano letters, Nanotechnology, Carbon, and et al.

lujing26@hqu.edu.cn