

The effect of the interphase on the elastic properties of Al–C₆₀ nanocomposites

Reshetniak V V^{1,2,®}, Aborkin A V² and Filippov A V^{1,3,4}

¹ State Research Center of the Russian Federation—Troitsk Institute for Innovation and Fusion Research, Pushkovykh Street 12, Troitsk, Moscow 108840, Russia

² Vladimir State University, Gor'kogo 87, Vladimir 600000, Russia

³ Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow 125412, Russia

⁴ Moscow Institute of Physics and Technology, Institutskiy Pereulok 9, Dolgoprudny, Moscow Region 141701, Russia

® reshetniak@triniti.ru

Interest in aluminum-based nanocomposites is associated with the prospects of their application in aviation, energetics, space and automotive industry. Due to their extremely high mechanical stiffness, fullerenes C₆₀ are widely used as reinforcing particles in nanocomposites. Ruoff and Ruoff [1] have estimated the bulk modulus k of a single molecule C₆₀ using the elastic sphere model: $k = 843$ GPa (that is much higher than that for diamond, 441 GPa). However, due to the smallness of fullerenes, the applicability of models and parameters of the theory of elasticity is questionable.

This paper considers the possibility of applying the theory of elasticity of heterogeneous media to describe the mechanical properties of Al–C₆₀ nanocomposites. The results indicate that the heterogeneous media models cannot be directly applied for calculating the elasticity of nanocomposites Al–C₆₀, however the model of interphase elasticity [2] can improve the results.

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[1] Ruoff R S and Ruoff A L 1991 *Nature* **350** 663–664

[2] Gurtin M E, Weissmüller J and Larche F 1998 *Philos. Mag. A* **78** 1093–1109