NOVEL SiO_xN_y COMPOSITE THIN FILMS WITH ALIGNED CARBON NANOTUBES NETWORK

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Reliable protection of solar cells from environmental factors is critically important nowadays. The high weight, brittleness, and inflexibility significantly limit the use of standard glass protection. Flexible glass-like films obtained by curing of the pre-ceramic polymers have become a promising alternative. The addition of carbon nanotubes (CNTs) into such film could improve its mechanical properties, since CNTs can serve as a reinforcement material.

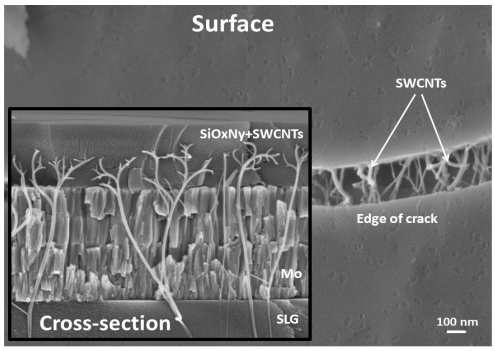

Fig. 1 SEM image of surface with crack and cross-section view of the composite SiO_xN_y/SWCNTs film

In this work, thin nanocomposite films of SiO_xN_y based on perhydropolysilazane (PHPS) with embedded thin sheets of single-walled (SW) CNTs were prepared and characterized. The uniqueness of these composites lies in the fact that the SWCNTs is horizontally oriented inside the PHPS matrix, which suggests the anisotropy of some properties. The experimental details of the spin casting and curing of PHPS was described in our previous study [1].

The FTIR spectroscopy of prepared composites showed that SWCNTs do not contribute to the spectra of cured PHPS films due to relatively low concentration of tubes in the samples. This is also confirmed by the results of EDX analysis. SEM micrographs showed the formation of nanocomposite films with a thickness of 350-700 nm. The SWCNTs film, when it enters into the PHPS matrix, remains densely packed, as it can be seen from the cross-section SEM micrographs of the composite layers (Fig.1). Thus, composite films of SiO_xN_y with horizontally oriented SWCNTs filler were prepared and characterized for the first time. Further search for new approaches to control the orientation of CNTs inside a polysilazane matrix will make it possible to obtain a number of protective nanocomposite coatings with unique mechanical, thermal and other properties.

References

1. E. Shmagina, M. Danilson, V. Mikli, S. Bereznev, 2022, Surface Engineering, 38:7-9, 769-777.

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