

NEW TWO-DIMENSIONAL CARBON NANOTUBES BIOMATERIAL FOR MEDICAL APPLICATION

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New two-dimensional carbon nanotubes material was prepared by means of pulsed carbon plasma condensation in vacuum. In the case of medical coating [1], the linear carbon chains are perpendicular to the surface on which they were deposited. The linear carbon chains are densely packed and kept together by relatively weak Van der Waals forces. The remarkable properties, which give it its bearing properties, is that it is highly compliant between the chains, making it a kind of super strength elastic velvet on the atomic scale. Distance between atoms along the length of a chain is 1.21Å. Between chains, the distance is 3.97Å.

The coating process is performed at temperatures of 0 to 300°C and so is applicable to polymer such as polyethylene and polyurethane such as well as metals, glass and other materials.

Coating thickness can be up to 20µm on hard substrates. Recommended thickness for most applications are 500 to 1000Å. Coating deposition rate is 1000Å per minute. Two-dimensional carbon nanotubes material adheres to most substrates, including stainless steel, glass, polymers, and silicone rubber. Adhesion is higher than substrate strength.

In mechanical tests on silicone rubber, including elongation of 600 per cent and multiple deformations, the coating withstood the test without visible damage. Neither crack nor exfoliation could be seen. In adhesion tests, the new material was removed only with parts of the substrate material, so its adhesion to most substrates is higher than the strength of the substrate.

Practically causes no significant denaturation of proteins adsorbed on its surface improving the biocompatibility of medical implants. Among its most prospective medical applications are cardiovascular devices, orthopaedic and dental implants, contact lenses, intraocular lenses, surgical needles and etc.