Metallisation of carbon nanofibres by Physical Vapor Deposition

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Vitreous grown carbon fibres (VGCF) are interesting candidates as reinforcement copper matrix composites. In this material the high conductivity of copper is combined with a low Coefficient of Thermal Expansion (CTE) reinforcement of the carbon nanofibre. This makes nanofibre reinforced copper matrix composites very attractive for applications in highly thermally loaded devices, e.g. as heat sinks for high power modules or optoelectronic components. The thermal properties of the composite heavily rely on interfacial contact between copper and fibres. However a low reactivity or low dissolution between the two constituents is usually observed. That leads to a poor thermal transport inside the composite and limit the potential application of the composite.
The thermal contact resistance at the interface can be reduced by an incorporation of appropriate intermediate layer consisting of chromium or titanium. The thickness of the intermediate layer must be kept as thin as possible (in the nanometer range). The metallisation of fibres can be achieved by Physical Vapor Deposition (PVD), but the homogeneous treatment of large amounts of VGCF presents a major challenge. Previously some investigations into the surface coating of particles or powders even of micron or submicron size by PVD have been carried out.
In the present study special reactors setup were applied for homogeneous coating of carbon nanofibre samples. The reactor includes a rotating sample holder that is additional mechanical activated.