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Fast low-temperature plasma calcination of ceramic nanofibres

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Because of their unique properties known only in ceramic materials the mesoporous ceramic nanofibres (CNFs) have been developed for many advanced materials applications in energy harvesting systems, batteries, catalysts, sensors to mention just a few. The usual way to fabricate CNFs consists of a sol-gel electrospinning procedure followed by a thermo-calcination process performed at temperatures up to 800°C for several hours. The slow thermo-calcination is the bottleneck in potential in-line or even continuous production, which significantly adds to the cost of CNFs and products manufactured therefrom. An additional problem is that the high calcination temperature is prohibitive in the preparation of inorganic nanofibres layers on heat-sensitive substrates and problematic in adhesion of the nanofibres to metal substrates. A novel fast ambient-air plasma technique enables the calcination at near-room temperatures and times less than 30 min that opens opportunities for the low-cost continuous manufacturing of thin CNFs mats and layers. Moreover to enhance the nanofibres flexibility the plasma calcination enables to manufacture organic/inorganic nanofibres with the core-shell structure. The results on plasma-calcination of TiO_2 and Al_2O_3 CNFs will be presented.

Biography

Mirko Černák is a professor at the Department of Physical Electronics, Faculty of Science, Masaryk University, Brno, Czech Republic. He is also the director of the R&D Centre for Low-cost Plasma and Nanotechnology Surface Modifications (CEPLANT) at Masaryk University. His research interests include the fundamental study of high-pressure electrical discharges, plasma chemistry, and applied plasma physics. He has published more than 100 papers in the scientific journals and has been cited more than 2100 times, H-index: 24

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