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The international debate on 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 thermocalcination 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 TiO2 and Al2O3 CNFs will be presented.

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