Lightweight, flexible SiCN ceramic nanowires applied as effective microwave absorbers in high frequency

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PII: S1385-8947(17)32120-4
DOI: https://doi.org/10.1016/j.cej.2017.12.008
Reference: CEJ 18169

To appear in: *Chemical Engineering Journal*

Received Date: 18 August 2017
Revised Date: 20 November 2017
Accepted Date: 2 December 2017

Please cite this article as: P. Wang, L. Cheng, L. Zhang, Lightweight, flexible SiCN ceramic nanowires applied as effective microwave absorbers in high frequency, *Chemical Engineering Journal* (2017), doi: https://doi.org/10.1016/j.cej.2017.12.008

Lightweight, flexible SiCN ceramic nanowires applied as effective microwave absorbers in high frequency

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Abstract: For the first time, the lightweight, flexible SiCN nanowires with highly efficient electromagnetic wave absorbing performance were prepared by electrospinning with subsequent high temperature annealing in nitrogen atmosphere. The nanowires are composed of cubic-SiC, free carbon, and silicon nitride nanocrystals. By means of controlling annealing time, the microstructure and chemical composition of as-prepared nanowires can be well regulated. The nanowires exhibit excellent flexibility with no fracture whatever conditions they are under for instance bending, twisting, folding, or twining. Carbon backbone was inserted into ceramic matrix to toughen the nanowire. The dielectric properties and electromagnetic (EM) wave absorption performance of nanowires were investigated between 2 and 18 gigahertz (GHz). The nanowires display great EM absorbing behaviour with an optimal reflection loss (RL) of -53.1 dB and the effective absorption bandwidth (EAB, RL below -10 dB) covers whole Ku band (12.4-18.0 GHz) at a small thickness of 1.95 mm. The distinctive microstructure of the nanowires give rise to their outstanding mechanical and EM performance that endow the nanowires potential to be utilized as lightweight, ultrastrong radar wave absorbers in harsh environments.