Polymer-based electrospun fibrous nanocomposites

T. Krasia-Christoforou

University of Cyprus, Department of Mechanical and Manufacturing Engineering
1 Panepistimiou Avenue, 2109, Aglantzia,
P. O. Box, 20537, Nicosia, CYPRUS

Electrospinning is considered to be one of the most powerful and versatile fabrication methods used in the production of fibers with diameters in the nano- and micrometer size range. This technique - which has already entered the industrial sector - enables the production of polymer, ceramic and organic-inorganic polymer-based nanocomposite fibers [1]. The latter can be derived through the incorporation of inorganic nanoparticles within polymer fibers during electrospinning or *via* their anchoring onto the fibers' surfaces by following post-modification strategies. Such organic-inorganic fibrous nanocomposites are highly attractive in biomedical, environmental, optoelectronic, sensing, catalytic and energy-related applications, owned to their unique properties including high surface to volume ratios, high porosity, and multifunctionality, deriving from the combination of the organic and inorganic counterparts.

In this presentation electrospinning-derived organic-inorganic fibrous nanocomposites will be presented and discussed, including Fe_3O_4 NP-containing electrospun microfibers and microrods with applicability in biomedicine [2, 3], in water remediation processes [4-6], sensing [7], etc., NP-containing electrospun fibrous mats employed as heterogeneous catalytic supports in organic synthesis [8], and light-emitting materials based on electrospun fibers with embedded upconverting NP and perovskite nanocrystals [9, 10].

References

[1] Savva and Krasia-Christoforou, "Encroachment of Traditional Electrospinning" in Electrospinning – Basic Research to Commercialization (Eds. S. Thomas, K. Ghosal, E. Kny), Royal Society of Chemistry (2018).

[2] Savva, Odysseos, Evaggelou, Marinica, Vasile, Vekas, Sarigiannis and Krasia-Christoforou Biomacromolecules **14**, 4436 (2013).

[3] Nikolaou, Avraam, Kolokithas-Ntoukas, Bakandritsos, Lizal, Misik, Maly, Jedelsky, Savva, Balanean and Krasia-Christoforou Materials Science & Engineering C **126**, 112117 (2021).

[4] Savva, Marinica, Papatryfonos, Vekas and Krasia-Christoforou RSC Advances **5**, 16484 (2015).

[5] Panteli, Savva, Efstathiou, Vekas, Marinica, Krasia-Christoforou, and Pashalidis SN Applied Sciences **1**, 30 (2019).

[6] Philippou, Christou, Socoliuc, Vekas, Tanasă, Miclau, Pashalidis and Krasia-Christoforou Journal of Applied Polymer Science e50212 (2020).

[7] Petropoulou, Kralj, Karagiorgis, Savva, Loizides, Panagi, Krasia-Christoforou and Riziotis Scientific Reports **10**, Article no. 367, 1 (2020).

[8] Savva, Kalogirou, Chatzinicolaou, Papaphilippou, Pantelidou, Vasile, Vasile, Koutentis, and Krasia-Christoforou, RSC Advances **4**, 44911 (2014).

[9] Antoniadou, Pilch-Wrobel, Riziotis, Bednarkiewicz, Tanasă and Krasia- Christoforou, Methods and Applications in Fluorescence **7**, 034002 (2019).

[10] Papagiorgis, Manoli, Alexiou, Karacosta, Karagiorgis, Papaparaskeva, Bernasconi, Bodnarchuk, Kovalenko, Krasia-Christoforou and Itskos, Frontiers in Chemistry **7**, 87 (2019).