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Nanoporous crystalline fibers from solution spinning

Christophe Daniel[1], Mohit Pathak[1], Chiara Bertarelli[2]

[1]Dipartimento di Chimica e Biologia "A. Zambelli", Università degli Studi di Salerno, 84084 Fisciano (SA), Italy
[2]Dipartimento di Chimica, Materiali e Ingegneria Chimica "G. Natta", Politecnico di Milano, Milan, Italy

ABSTRACT: Driven by the interest in nanofibers applications, solution spinning has raised a great interest in terms of both fundamental and applied science. Electrospinning is probably the most extensively studied and widely applied method to form nanofibers, but many other solution spinning methods such as sheared wet spinning, solution blow spinning, or centrifugal spinning have been developed. [1]
This contribution will focus on syndiotactic polystyrene (s-PS) and poly(2,6-dimethyl-1,4-phenylene)oxide (PPO) fibers obtained by different solution spinning methods (Figure 1).
These two commercial thermoplastic polymers are able to form co-crystalline phases with several low-molecular-mass guest molecules which, in turn, by suitable guest extraction procedures, can give nanoporous crystalline forms. [2, 3] The nanoporous crystalline phases of PPO and s-PS rapidly absorb volatile organic compounds (VOCs) even if present in traces in air or water and hence s-PS and PPO nanoporous materials are particularly interesting for potential applications in chemical separations, in air/water purification and molecular sensorics.
Appropriate conditions to obtain s-PS and PPO fibers by electrospinning and sheared wet spinning will be presented and discussed. Different aspects relative to the morphology, the crystalline structure as well as the transport properties of s-PS and PPO nanofibers will be also reported.

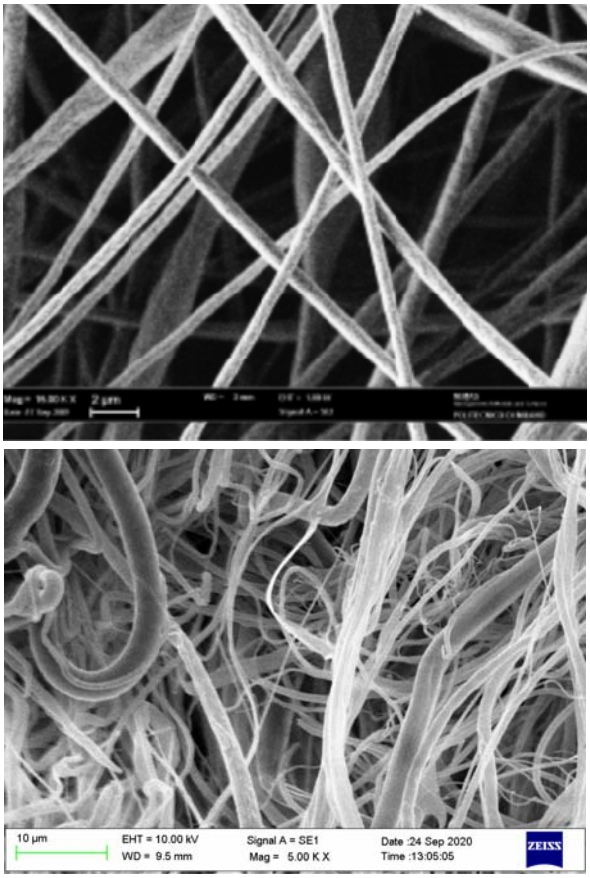

Figure 1: SEM pictures of s-PS electrospun fibers (upper picture; average diameter: 561 nm) and PPO sheared wet spun fibers (lower picture; diameter 700 nm - 3 µm).

KEYWORDS: syndiotactic polystyrene, poly(2,6-dimethyl-1,4-phenylene)oxide nanoporous crystalline phases, sheared wet spinning, electrospinning.

References

1. C. J. Luo, S. D. Stoyanov, E. Stride, E. Pelan, M. Edirisinghe *Chem. Soc. Rev.*, 2012, 41, 4708-4735.
2. G. Guerra, C. Daniel, R. Rizzo, O. Tarallo *J. Polym. Sci., Part B: Polym. Phys.* 2012, 50, 305-322.
3. B. Nagendra, A. Cozzolino, C. Daniel, P. Rizzo, G. Guerra, F. Auriemma, C. De Rosa, M.C. D'Alterio, O. Tarallo, A. Nuzzo *Macromolecules* 2019, 52, 9646-9656.