

PHOTOCHROMIC ELECTROSPUN FIBERS BASED ON TUNGSTEN HEXACHLORIDE

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Photochromism is defined as the light induced reversible change of color [1]. The synthesis and applications of variety of photochromic materials has developed rapidly during the past decade.

Electrospinning is one of the most widely used processes for the production of nanofibers. This technique of producing nanofibers employs electrostatic forces for stretching the viscoelastic fluid [2]. As depicted in Figure 1 a high DC voltage is applied to a polymer fluid such that charges are induced within the fluid until they reach a critical amount resulting in a fluid jet to erupt from the droplet at the capillary tip of the needle. The electrospinning jet will travel towards the region of lower potential, which in most cases, is a grounded metallic collection target [3]. The dry fibers are accumulated on the surface of the collection screen resulting in a nonwoven random fiber mesh of nano to micron diameter fibers. The process can be adjusted to control the fiber diameter by varying the electric field strength and polymer solution concentration.

We report on photochromic properties of tungsten hexachloride (WCl_6) and Polyvinylpyrrolidone (PVP) blend solution prepared by electrospinning technique. WCl_6 /PVP fibers produced by electrospinning on glass substrate represent color alteration under UV lamp as displayed in Figure 2. The fiber sustains the blue color unless held into darkness. It demonstrates that the photochromic fiber has a very good memory effect. The reversible coloration process takes about 3 minutes while the bleaching process takes about 3 hours. The coloration cycling of the material is repeatedly reversible and its durability has been tested several times functioning acceptably well.

References

- [1] Heinz Dürr, Henri Bouas-Laurent, Photochromism: Molecules and Systems, ELSEVIER, 2003, ISBN: 0-444-51322-1
- [2] Journal of Nanomaterials, Design Modifications in Electrospinning Setup for Advanced Applications, Volume 2011
- [3] Seeram Ramakrishna et al. World Scientific Publishing Co. Pte. Ltd., An Introduction to Electrospinning and Nanofibers, ISBN 981-256-415-2

Figures

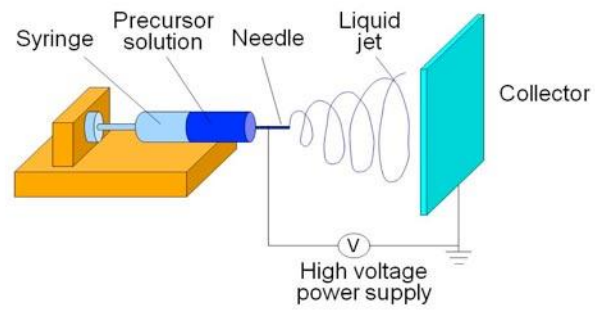


Figure 1 – Schematics of electrospinning system

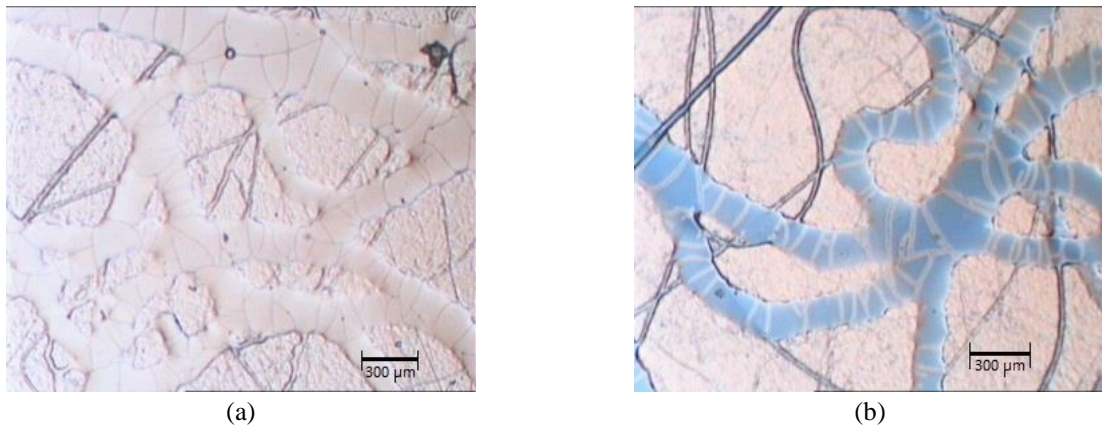


Figure 2 – Electrospun microfibers of WCl_6/PVP (a) before and (b) after the UV irradiation