

Electrospinning of Fucoïdan Based Nanofiber Mats with Antibacterial and Antioxidant Activity from Brown Algae Extracts Based on Natural Deep Eutectic Solvents

Kyung Ju Jang, Sang Eun Hong, Jong Jin Jung and Kuk Ro Yoon*

Department of Chemistry Hannam University, Organic Nanomaterial Lab, 1646 Yuseong-daero Yeseong-gu Daejeon 306-811 Korea

Abstract: In this work, Natural Deep Eutectic Solvents (NDES) using choline chloride as salts and glycerol and ethylene glycol as hydrogen bond donors were prepared. The different water content in NDES was used for extraction parameter optimized. The fucoïdan from brown algae extracted using NDES as solvents. The fucoïdan extracts based on NDES with polycaprolactone (PCL) were electrospun to obtain nanofibers. The Paper disc method used for anti-bacterial assay (against *S. aureus* and *E. coli*) and the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method used for antioxidant assay were evaluated. NDES on fucoïdan from brown algae extracts were characterized by FT-IR (Fourier Transform Infrared Spectroscopy), HPLC (High Performance Liquid Chromatography), UV vis-spectroscopy, GFC (Gel Filtration Chromatography). PCL-fucoïdan nanofibers were characterized by Optical microscope (OM), Scanning Electron Microscopy (SEM). These results nanofiber mats were promising for the potential application of cosmetic and medical ingredients.

Keywords: Deep Eutectic Solvents (NDES), Fucoïdan, Nanofibers mats, antioxidant, etc.

1. References

- [1] Yuntao Dai, Geert-Jan Witkamp, Robert Verpoorte, and Young Hae Choi, "Halogenation reactions in biodegradable solvent: Efficient bromination of substituted 1-aminoanthra-9,10-quinone in deep eutectic solvent (choline chloride : urea)," *Anal. Chem.*, Vol. 85, pp. 6272-6278, 2013.
- [2] Sunanda Balaso Phadtare and Ganapati Subray Shankarling, "Deep eutectic solvents: syntheses, properties and applications," *Green Chem.*, Vol. 12, pp. 458-462, 2010.
- [3] Qinghua Zhang, Karine De Oliveira Vigier, Sébastien Royer and François Jérôme, "Antibacterial effect of fucoïdan from *Sargassum wightii* against the chosen human bacterial pathogens," *Chem. Soc. Rev.*, Vol. 41, pp. 7108-7146, 2012.
- [4] Wilfred Wing Fung Mak, "Extraction, Characterization and Antioxidant Activity of Fucoïdan from New Zealand *Undaria pinnatifida* (Harvey) Suringar," M.S. thesis, Dept. Health and Environmental Sciences. Eng., Auckland Univ., Auckland, New Zealand, 2012.
- [5] Thangapandi Marudhupandi, Thipparamalai Thangappan Ajith Kumar, "Antibacterial effect of fucoïdan from *Sargassum wightii* against the chosen human bacterial pathogens," *Int J Pharm Pharm Sci*, Vol. 2(10), pp. 156-158, 2013.
- [6] Jirawan Oonmetta-areea, Tomoko Suzukib, Piyawan Gasalucka, Griangsak Eumkeb, "Antimicrobial properties and action of galangal (*Alpinia galanga* Linn.) on *Staphylococcus aureus*," *LWT.*, Vol. 39, pp. 1214-1220, 2006.
- [7] Sang-Myung Jung, Sung Hoon Kim & Seul Ki Min, Hwa Sung Shin, "Controlled activity of mouse astrocytes on electrospun PCL nanofiber containing polysaccharides from brown seaweed," *In Vitro Cell.Dev.Biol.—Animal*, Vol. 48, pp. 633-640, 2012.