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Release of retiny acetate from electrospun nanofibers of poly (vinyl alcohol) and inclusion complex formed by β-cyclodextrin

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Retinyl acetate (RA) was effectively incorporated into nano-fibers of polyvinyl alcohol (PVA) at 10% (w/w) of PVA in order to develop encapsulating for prolong shelf-life and thermal stability assisting by β-cyclodextrin inclusion complex (β-CD-IC). The nanofibers were produced via electro spinning technique from aqueous mixture of PVA/ retinyl acetate and PVA/retinyl acetate/ β-CD. The rheological behavior and conductivity of the solutions were analyzed to investigate variations prior to electrospinning. The physical and thermal properties of encapsulated retinyl acetate were determined by scanning electron microscopy (SEM), X-ray diffraction (XRD) and differential scanning calorimetry (DSC). The nanofibers of PVA/ retinyl acetate and PVA/retinyl acetate/ β - CD exhibited a bead free average fiber diameters 264±61nm and 223±49 nm, respectively. The surface chemistry of the functional nano-fibers webs were investigated by X-ray photoelectron spectroscopy (XPS).Thermogravimetric analyzes (TGA) demonstrated a different thermal stability between the bioactive and the polymer with and without β -CD. Square-wave voltammogram peak current change was used to follow the release kinetics of retinyl acetate from the nanofibers in the electrochemical cell. The results obtained indicate that the retinyl acetate coated inside PVA/ β -CD nanofibers webs much better protected against oxidation to extend the shelf-life than RA encapsulated in PVA nanofibers stored at room conditions. In addition, RA encapsulated in the PVA/ β -CD has better thermal stability than PVA nanofibers. The results show that, electro spinning technique has a promising potential in food industries for the production of efficient and effective encapsulating functional bio-actives under ultra-thin nanostructures.

Biography

Solomon Mengistu Lemma has MSc in Food Engineering. He is working to obtain his PhD studies in Food Nanotechnology at the Free University of Bozen, Bolzano, Italy by the end of 2014. He has conducted research studies on micro and nano-sensors in Denmark Technical University and nano-encapsulation of bioactives in Swinburne University of Technology, Australia to fulfil his PhD work. He has research and teaching experiences in food processing and engineering in Bahir Dar University, Ethiopia and Free University of Bozen, Bolzano, Italy since 2008. He has published three papers in reputed journals and one book related to food.

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