Responsive-Responsive Assembly Functional Photo-cross-linked Hydrogel Bilayer Thin films From Poly (N-isoprpylacrylamide-Co-Vanillin acrylate-Co- Malimide): Synthesis, Characterizations and SPR-OW for Swelling Properties

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Abstract

In recent study we established hydrogel bilayers with non-responsive and functional dual responsive thin films. Here, we will discuss a new strategy of hydrogel bilayers thin films depending on thermo-responsive and functional Thermo-pH dual responsive layers. Vanillin acrylate (VA) monomer has been synthetized and evaluated in one step reaction. Environmental functional photo-cross-linker polymers were synthetized by the copolymerization of N-isoprpylacrylamide, (5, 10 and 15 mole %) (VA) and (2, 5 and 10 mole %) photo-cross-linkers. Otherwise, three different mole ratios (2, 5 and 10 mol %) of thermo-responsive photo-cross-linkers polymers were prepared by copolymerization of (NIPAAm) and (DIMAAm). Polymers were characterized by 1HNMR, FTIR, UV, gel permeation chromatography (GPC) and differential scanning calorimetery (DSC). Lower critical solution temperatures (Tc) were determined by UV.vis.Spectroscopy and micro-DSC. Hydrogel bilayer was formed by spin coating of polymer solution of poly (N-isopropylacryamide-Co-malimide) layer A over gold with adhesion promoter, and then cross-linked by UV-irradiation. The next layer was formed by spin coating of polymer solution poly (N-isopropylacryamide-Co-malimide-Co-VA) layer B over layer A, and then cross-linked by UV-irradiation. The swelling properties and Tc were determined by SPR/OW. The study aims to establish biosensor hydrogel thin films through the active aldehyde group used for immobilization of biological molecules with amino group e.g. amino acids, proteins, DNA and RNA. The responsive-responsive bilayer have a highly sensitivity than one sensitive layer the gel vessel can easily release the target molecule by changing the surrounding environment.

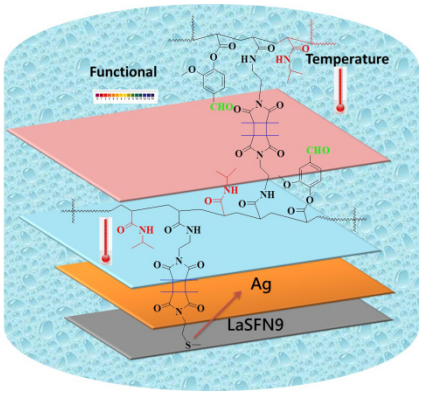


Figure: Schematic diagram for photo-cross-linked polymers and formation of hydrogel

Recent Publications

1- Abdelaty MSA, Environmental Functional Photo-Cross-Linked Hydrogel Bilayer Thin Films from Vanillin. J Polym Environ 3:1-14 (2017). doi.org/10.1007/s10924-017-1126-y

2- Abdelaty MSA, Preparation and Characterization of New Environmental Functional Polymers Based on Vanillin and Nisopropylacrylamide for Post Polymerization. J Polym Environ 3:1-11 (2017). doi.org/10.1007/s10924-017-0960-2

3- Abdelaty MSA and Kuckling D Synthesis and Characterization of New Functional Photo-Cross-Linkable Smart Polymers Containing Vanillin Derivatives. Gels 2:1-13 (2016).

4- Young-Jin K and Yukiko T. M Thermo-responsive polymers and their application as smart biomaterials. J. Mater. Chem. B 5, 4307-4321 (2017). DOI:10.1039/C7TB00157F

5- Deshmukh PK, Ramani KP, Singh SS, Tekade AR, Chatap VKPatil, GB, and Bari SB. Stimuli-sensitive layer-by-layer (LbL) self-assembly systems: targeting and biosensory applications. J. Control. Release, 166: 294-306 (2013). doi: 10.1016/j.jconrel.2012.12.033

Biography



Momen S.A. Abdelaty is Assistant Professor at Chemistry department, Faculty of Science, Al-Azhar University. He has finished his bachelor in general chemistry at Al-Azhar University. Mater thesis in polymer chemistry has been finished at Chemistry department, Faculty of Science, Al-Azhar University. He has granted PhD scholarship in University of Paderborn Germany from 2008-2012 with the group of Professor Dr. Dirk Kuckling. The project title was photo-cross-linked polymers and hydrogel thin film. After that he has followed postdoc scholarship with the same group. Till now he is working as Assistant Professor in polymer chemistry at Chemistry department, Faculty of Science, Al-Azhar University.

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Notes/Comments: