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SYNTHESIS AND MORPHOLOGICAL INSIGHTS INTO NOVEL, STABLE AND BIOCOMPATIBLE SMART HYDROGELS WITH PROSPECTIVE WOUND HEALING PROPERTIES

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A latticework of hydrophilic macromolecular structures results in the formation of hydrogels. These hydrogels are usually synthesized by chemical or physical crosslinking strategies. Owing to their striking attributes such as hydrophilic nature, high biocompatibility and flexible morphology, they are rendered as promising candidates for potential biomedical applications. In this current study, we present the mechanism of formation of stable, smart, pH-responsive hydrogels via one-step, facile, free radical aqueous copolymerization. The stability of the hydrogels along with their predisposed macroporous structure are attributed to the phenomenon of phase separation along with monomer feed ratio and water content. Molecular level evaluation further divulge the interrelation between hydrogen bonding and strong electrolytic complexation amongst the monomers. Furthermore, we successfully established the remarkable biocompatibility of pAcD (poly(AAc-co-DEAEMA)). More importantly, oral administration of the hydrogels to the rat model did not produce any significant change in the vital organs, namely, hippocampus (CA1 section) of the brain, myofibrillar and myocytes nuclei of heart, hepatocytes and central vein of liver and parenchyma, tubules and glomeruli of kidney. Owing to their remarkable biocompatibility, stimulus (pH) responsiveness, and cost-effective production, pAcD hydrogels can be used for the targeted delivery and sustained release of various pharmaceutical formulations. As a future directive, we have also looked at the wound healing properties of this hydrogel with herbal formulations and it resulted in exceptionally speedy wound healing process.

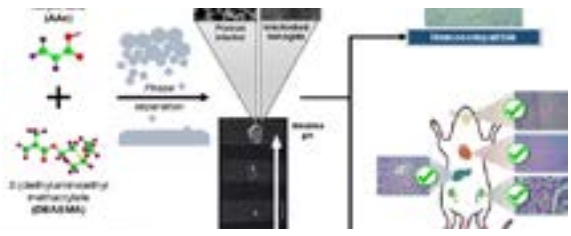

Figure 1: Macroporous interior with interlocked nanoglobules as stable building blocks in pAcD gels with high in-vitro and in-vivo biocompatibility.`

Recent Publications

1. Suhag, D et al. (2017) Sustainable growth and lipid production from Chlorella pyrenoidosa using N-doped carbon nanosheets: unravelling the role of graphitic nitrogen. ACS Sustainable Chemistry & Engineering. 6(1):774-780. Doi:10.1021/ acssuschemeng.7b03103.
2. Suhag D et al. (2017) Electrochemically synthesized highly crystalline nitrogen doped graphene nanosheets with exceptional biocompatibility. Scientific Reports. 7:537. Doi:10.1038/s41598-017-00616-8.
3. Suhag D et al. (2016) Hydrothermally functionalized biocompatible nitrogen doped graphene nanosheets based biomimetic platforms for nitric oxide detection. J. Mater. Chem. B. 4(27):44780-4789. Doi: 10.1039/ C6TB01150K.
4. Suhag D et al. (2015) Hydrothermal synthesis of nitrogen doped graphene nanosheets from carbon nanosheets with enhanced electrocatalytic properties. RSC Adv. 5(50):39705-39713. Doi: 10.1039/C5RA05060J.
5. Suhag D et al. (2015) N-doped carbon nanosheets with antibacterial activity: mechanistic insight. RSC Adv. 5(30):23591-23598. Doi: 10.1039/C4RA17049K.

Biography

Deepa Suhag is the Asst. Professor at Amity University, India. She has her expertise in material sciences, electrochemistry and biomimetics. Her major efforts are focused towards exploring the biocompatibility properties of the as-synthesized materials. Furthermore, she aims to establish the materials synthesized by her for their prospective biomedical applications such as bi-osensing, bio-imaging and theranostics. She aims to contribute towards the wellbeing and uplifting of human life standards by making theranostics as non-invasive as possible while maintaining their affordability.

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