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Spherical nanocellulose-based highly efficient and rapid multifunctional naked-eye Cr(VI) ion chemosensor and adsorbent with mild antimicrobial properties

Bhagat Ram[1], Ghanshyam S. Chauhan*[1] Akshita Mehta[2], Reena Gupta[2], Kalpana Chauhan[3],

[1]Department of Chemistry, Himachal Pradesh University, Summer Hill, Shimla, Himachal Pradesh 171005, India
[2]Department of Biotechnology, Himachal Pradesh University, Summer Hill, Shimla, Himachal Pradesh 171005, India
[3]Department of Chemistry, Shoolini University, Solan, Himachal Pradesh 173229, India
*email: ghanshyam_in2000@yahoo.com; ghanshyamschauhan@gmail.com

ABSTRACT

To meet the challenges of sustainable growth it is imperative to develop smart multifunctional materials with high cost-effectiveness and positive environmental impact. In this study we report a spherical nanocellulose (SNC)-based multifunctional material, SNC-Chemosensor, which acts as naked-eye sensor, rapid adsorbent and antimicrobial agent. It showed fluorescent quenching properties for Cr(VI) ions, which was studied under different Cr(VI) ions concentrations. At extremely low concentration a high fluorescent intensity was observed. Detection limits of Cr(VI) ions was obtained to be less than 30 ppb from 100 ppm which is well below their maximum contamination standard in drinking water. SNC-Chemosensor also shows rapid Cr(VI) ions adsorption from their aqueous solutions even at pH 7.0 contrary to that is reported in literature. Also, SNC-Chemosensor can be regenerated by using 0.1*N* NaOH as a desorbing agent. SNC-Chemosensor has mild biocidal activity as observed against the representative microorganisms Gram (+), *S. aureus*, Gram (−), *E. coli* and *A. niger*.

KEYWORDS: spherical nanocellulose, naked eye sensor, fluorescence study, Cr(VI) ions uptake, antimicrobial activity.