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Nanocrystalline scaffold of AMT-Ag for electro-sensing of ciprofloxacin drug in biological fluid and pharmaceutical formulation

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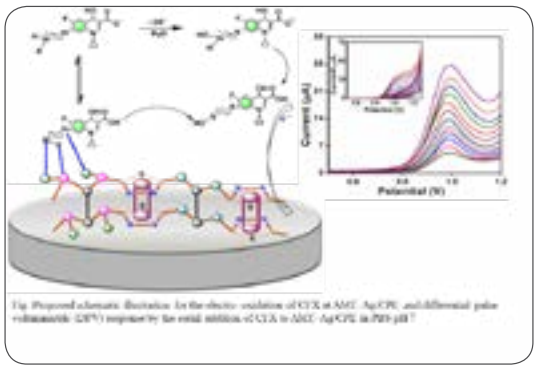
The advancement in the chemistry of the coordination polymers having designable architectures fabricated from functionalized building blocks is an emerging area from last two decades. The further challenges are the construction of coordination network assembly having electro-active nano-pores. We are first time exploring a nanocrystalline coordination polymer (NCCP) framework resulting from 2–amino–5–mercapto–1,3,4–thiadiazole (AMT) and silver nitrate. In the infinite polymer arrangement of AMT–Ag, silver (I) centers are bridged by tecton AMT through the amino linkage and exocyclic thiol. The grasped nano–sized granules of AMT–Ag are investigated by FE-SEM. The crystalline nature along with the oxidation state of silver is studied through XRD, TEM and XPS respectively. Additionally, the thermal stability and activation energy for thermal decomposition of NCCP are scrutinized by thermo–gravimetric analysis. Furthermore, the efficient electron transfer kinetics is probed by using Fe (II)/Fe (III) redox couple in phosphate buffer pH 7 via cyclic voltammetry. The excellent electroactivity is employed in the electro-detection of a biologically active drug molecule ciprofloxacin hydrochloride (CFX). The anodic peak current revealed a linear dependence with CFX concentration with sensitivity and limit of detection as 0.001 μA/μM and 5.0 nM, respectively. The effective assay of the drug is caused by the excellent electron channeling through the pores of polymeric nano–crystallites. Further, the concept is extended and established in the voltammetric detection of CFX in biological fluid and pharmaceutical formulation by a considerably high sensitivity (0.002 mA/mM and 0.007 mA/mM) and the detection limit (22 nM and 60 nM) respectively. Our established system has potential for fabrication of high performance electro-chemical sensors for assay of biologically significant drug molecule.



Recent Publications:

1. Tiwari M, Gupta S and Prakash R (2014) One-pot synthesis of coordination polymer- 2,5-dimercapto-1,3,4-thiadiazole-gold and its application in voltammetric sensing of resorcinol. RSC Advances 4:25675-25682
2. Li Y and Chen S M (2012) The electrochemical properties of acetaminophen on bare glassy carbon electrode. International Journal of Electrochemical Science 7(3):2175-2187.
3. Li B, Wen H M, Cui Y, Zhou W, Oian G and Chen B (2016) Emerging multifunctional metal–organic framework materials. Advanced Materials 28:8819–8860.
4. Tiwari M, Kumar A and Prakash R (2016) The nanocrystalline coordination polymer of AMT–Ag for an effective detection of ciprofloxacin hydrochloride in pharmaceutical formulation and biological fluid. Biosensors and Bioelectronics 85:529–535.
5. Cai W and Chu C C (2015) Metal–organic framework-based nanomedicine platforms for drug delivery and molecular imaging. Small 11(37):4806-22.

Biography

Vinita has her expertise in synthesis of nanosized metal coordination polymers and metal nanoparticles for sensing application. Her system based on metal organic framework. She has built this system after 2 years of experience in research institutions. Her established system has potential for fabrication of high performance electrochemical sensors, biosensors and colorimetric sensors for the detection of biologically important drug and biomolecules. Her successful effort in the area of silver and palladium based coordination polymers synthesis and their sensing application has been recently recognized

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