Student Talk

Inter-Disciplinary Explorations in Chemistry (I-DEC 2018)

Towards the Role of Tyrosine in the Formation of Metal Nanoclusters

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Abstract: Synthesis and applications of nanomaterials is one of the foremost scientific endeavours in modern material science. Nanoclusters (NCs), comprising of small number of metal atoms in their zero-valent states is of seminal importance owing to their luminescent properties.[1,2] To investigate the effects of the ligands on controlling the size and shape of the nanomaterials,[2] the role played by the template is rather imperative. Mukherjee *et al.* already reported synthesis of two distinct NCs (Copper and Silver) using a common capping agent, Human serum albumin (HSA). Along with the synthetic protocol and applications, they proposed that the 18 tyrosine (Tyr) residues in HSA triggered the formation of those NCs.[3,4] Hence the activity of Tyr outside the protein scaffold generates interest and needs further investigations to substantiate the reported proposal.

We have successfully synthesized monometallic NCs using Cu and Ag as the metal precursors and the amino acid, tyrosine as a template. We have designed a relatively simple one-pot synthesis and well characterized the photo-physical properties and morphology of these luminescent NCs. Further study reveals that the tyrosine moiety also contributes to luminescence property of the same NCs by forming the fibril structure in the alkaline environment.[5] The fibrils of very comparable morphology of bare tyrosine[6] with CuNCs system were formed which has been characterized from the photophysical studies as well as TEM images. Herein, we reveal that the formation of the tyrosine fibril and CuNCs happens together and this mixed system shows the photophysical properties like a single system and time-dependent destruction of fibril structures as well.

References:

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4. Ghosh, S.; Das, N. K.; Anand, U.; Mukherjee, S. *J. Phys. Chem. C* **2015**, *119*, 24657−24664.
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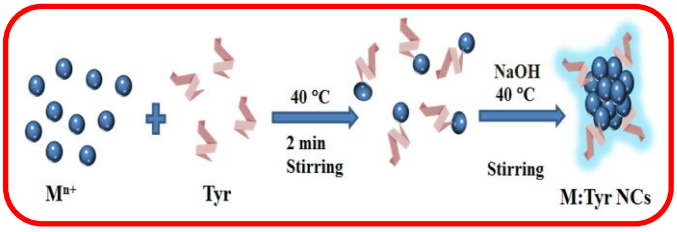
6. Banik, D.; Kundu, S.; Banerjee, P.; Dutta, R.; Sarkar, N. *J. Phys. Chem. B* **2017**, *121*, 1533−1543.



Scheme: General synthetic scheme of NCs synthesis.

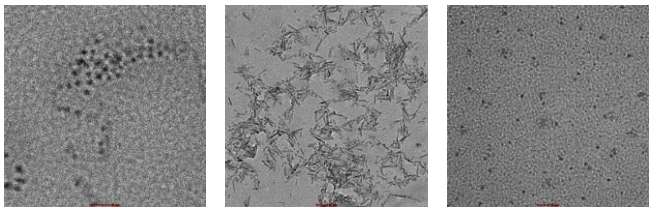


Figure: TEM images at different time.

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Bio-Sketch of Speaker

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COURSE	UNIVERSITY/BOARD	YEAR OF PASSING	MARKS OBTAINED	DIVISION
M.Sc. (chemistry)	PRESIDENCY UNIVERSITY	2015	73.5%	1st
B.Sc. (HONS.) (chemistry)	WBSU (Rahara Ramakrishna Mission V.C. college)	2013	70.6%	1st
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RESEARCH WORK:

- **Publication:**
  1. Das, N. K.; Chakraborty, S.; Mukherjee, M.; Mukherjee, S. Enhanced Luminescent Properties of Photo-Stable Copper Nanoclusters through Formation of "Protein-Corona"-Like Assemblies. *ChemPhysChem* **2018**, *19*, 2218-2223.
  2. Das, N. K.†; Ghosh, S†; Chakraborty, S.; Mukherjee S. Quantifying Hg(II) ions in solution and bound to Insulin by robust gold nanoclusters. (Manuscript under preparation)
  3. Dutta, P.; Nandi, D.; Datta, S.; Chakraborty, S.; Das, N.; Chatterjee, S.; Ghosh, U. C.; Halder, A. Excitation Wavelength Dependent UV Fluorescence of Dispersed Modified Graphene Oxide: effect of pH. *Journal of Luminescence* **2015,** *168*, 269-275.
- **Project work:**

  A project work on "Structural change of Graphene Oxide with variation of SDS in different pH medium by Spectroscopic method, pH meter and Conductometer" under supervision of Dr. Arnab Halder, Presidency University, Kolkata.