Now in the 60th year

From materials to clean water:

Making affordable sensors for clean water

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Co-founder

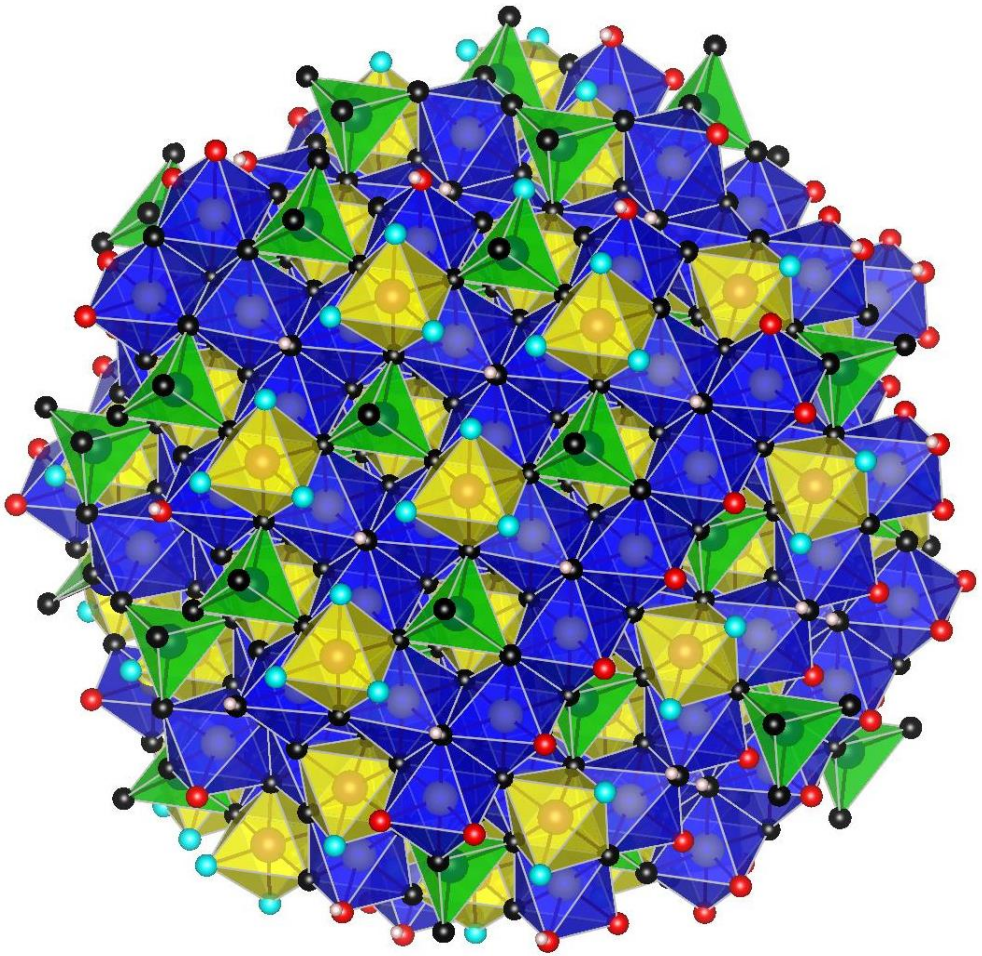
InnoNano Research Pvt. Ltd.
InnoDI Water Technologies Pvt. Ltd.
VayuJAL Technologies Pvt. Ltd.
Aqueasy Innovations Pvt. Ltd.
Hydromaterials Pvt. Ltd.

Professor-in-charge

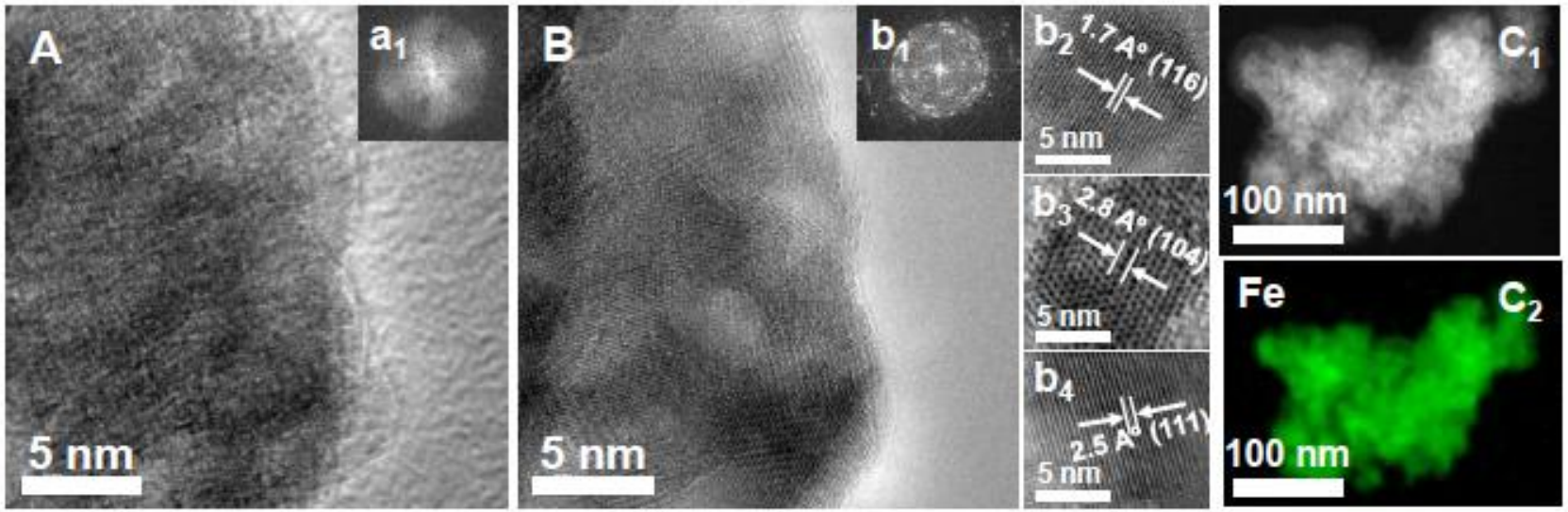
Associate Editor

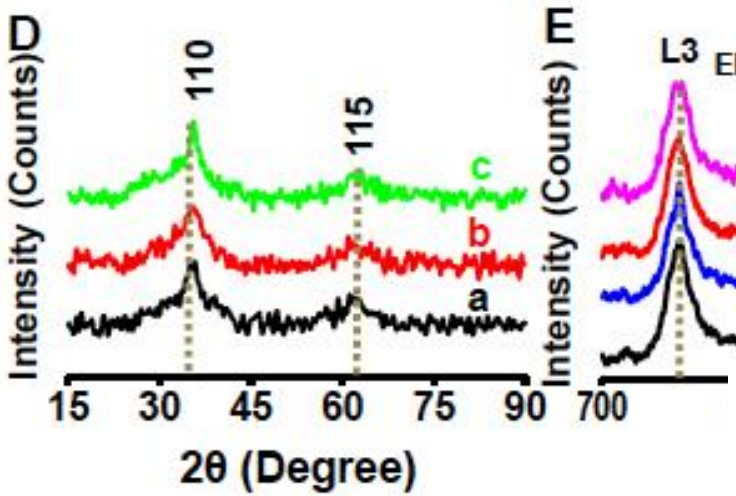
ACS Sustainable Chemistry & Engineering

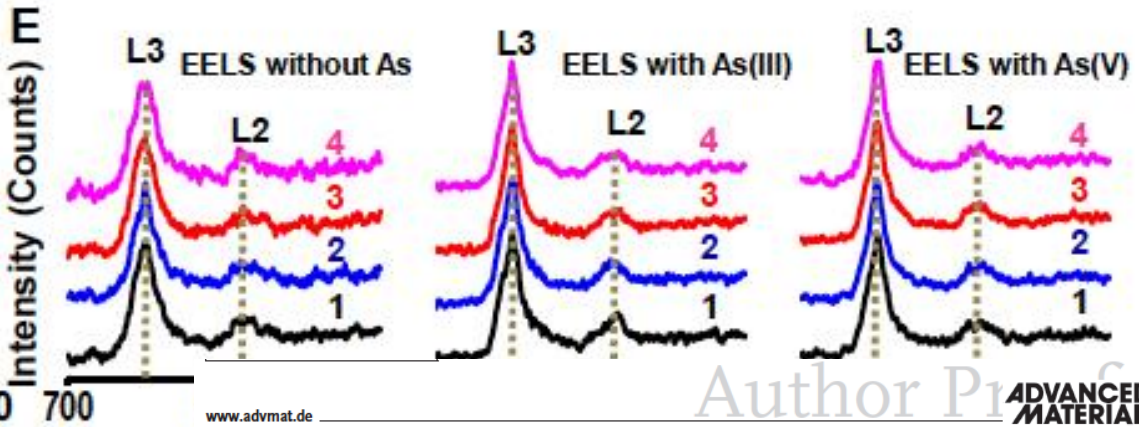
One day interactive session on sensors, ICCW, December 10, 2019



Chennu Sudhakar et al. ACS Sus. Chem. & Engg. 2018





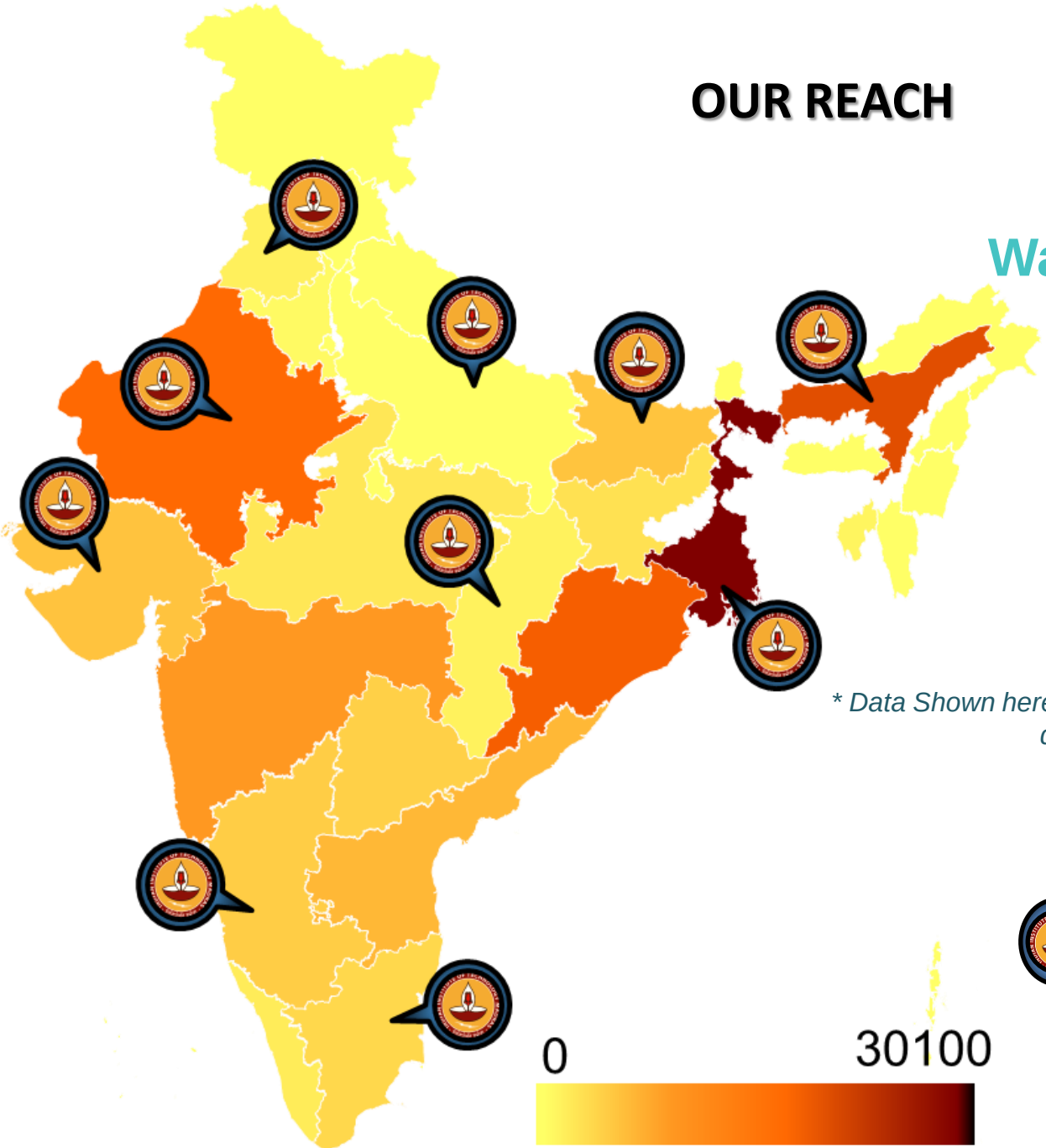


www.advmat.de
ADVANCED MATERIALS

Confined Metastable 2-Line Ferrihydrite for Affordable Point-of-Use Arsenic Free Drinking Water

By *Avula Anil Kumar, Anirban Som, Paolo Longo, Chennu Sudhakar, Radha Gobinda Bhuin, Soujit Sen Gupta, Anshup, Mohan Udhaya Sankar, Amrita Chaudhary, Ramesh Kumar, and T. Pradeep**

OUR REACH



Arsenic, Fluoride, Iron, Salinity, Nitrate affected

Water quality affected habitations of India

Data collected from
http://indiawater.gov.in

** Data Shown here is as per laboratory testing results entry done on regular basis hence may change*

Collected on 29.05.2018

Regions where our technologies have been implemented

Completed 3 years maintenance (stipulated: 2 years) for 330 bamboo unit project in Nadia

Minimum uptime: 91%, Maximum: 98%

Only 4/330 have reported arsenic above 10 ppb

Benefiting over 100,000 children and villagers

Seeing how the new adsorbents are changing the dynamics at the ground level (type 1 of our efforts)

Name of the scheme: Mahilan Wala (TW9144), District: Amritsar
Population: 2610, Daily demand@70 LPCD: 188 kLD, OHSR Capacity: 100 kL

Plan for immediate future

ARSENIC TOXIC WATER

India Mark II hand water pump – most common water pump used globally

InnoNano Research's in-line arsenic removal filtration system

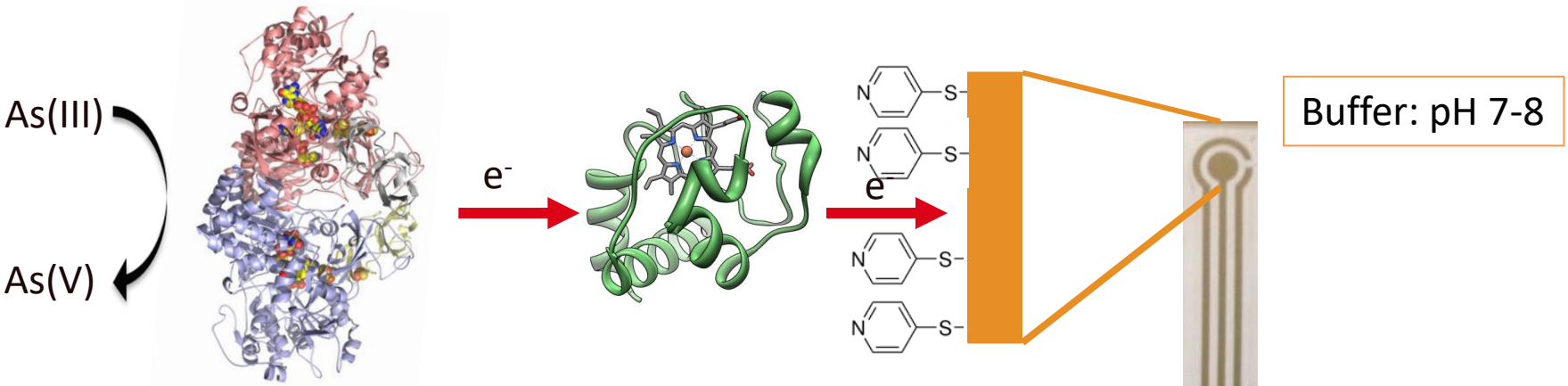
In-line arsenic sensor and remote data management – indicates when filtration systems require maintenance.

IMPROVED FILTER SUSTAINABILITY

SUSTAINABLE SOURCE OF ARSENIC FREE SAFE DRINKING WATER

Biosensor Design

1st Generation Design (Mediated Electrochemistry)



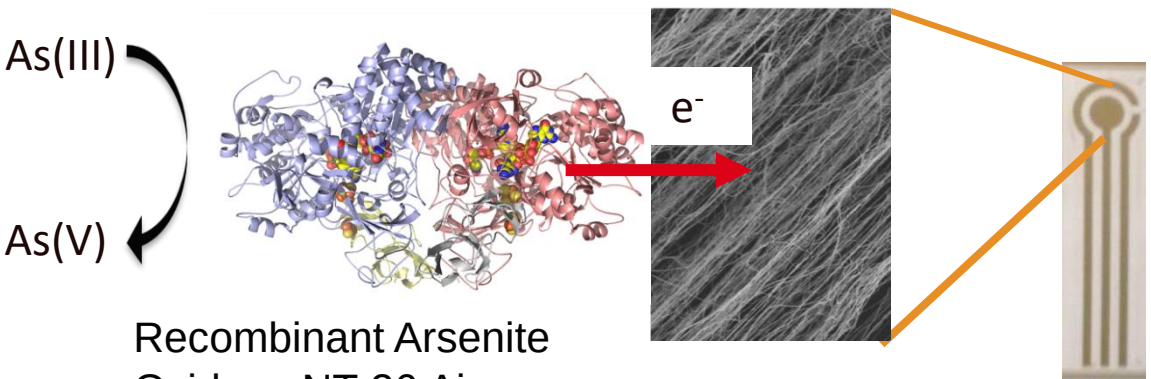
Recombinant Arsenite Oxidase NT-26 Aio

Horse Heart Cytochrome C

Aldrithiol

Low-cost Gold sputtered thin film on PET substrate

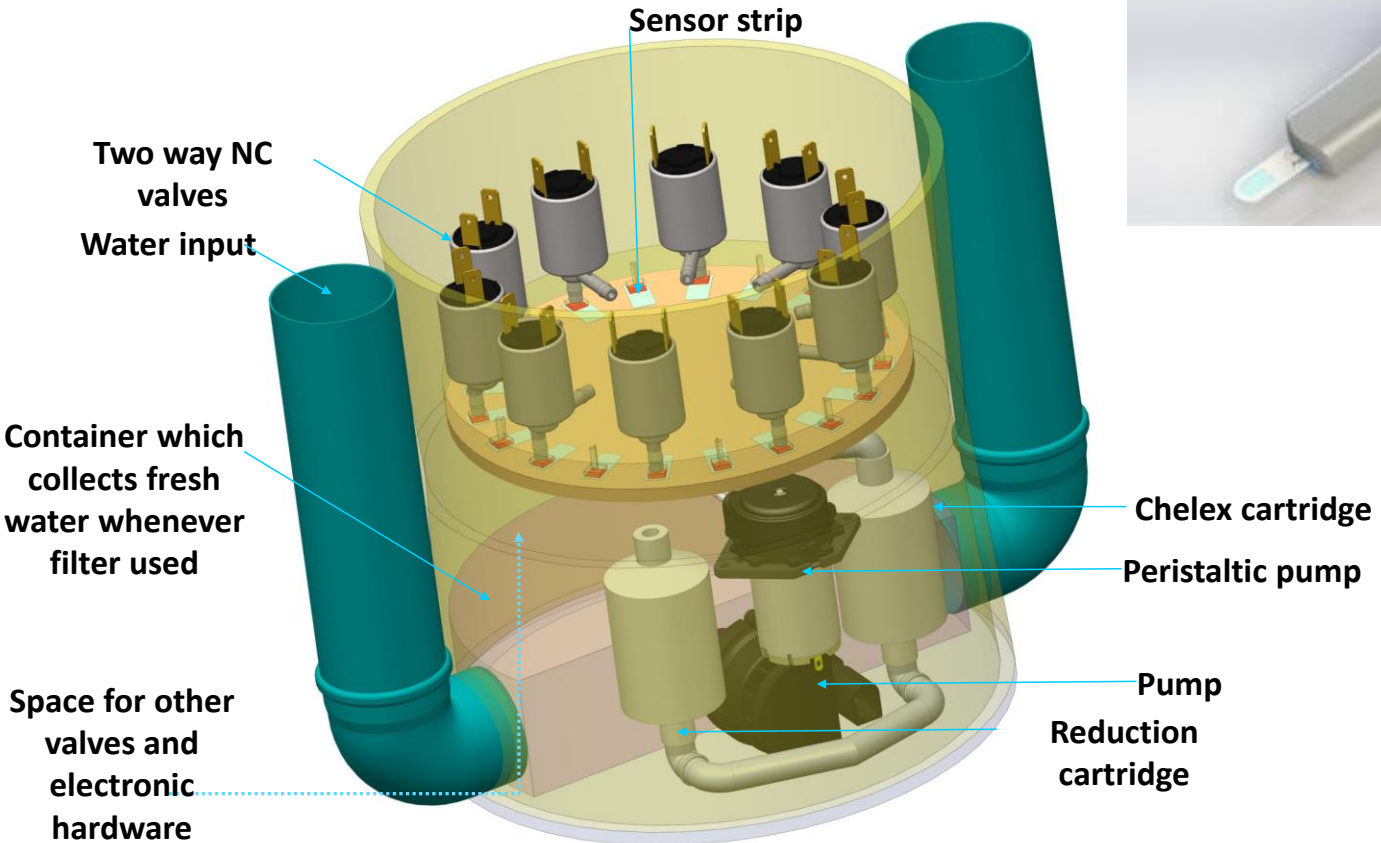
2nd Generation Design (Direct Electron Transfer)



Recombinant Arsenite Oxidase NT-26 Aio

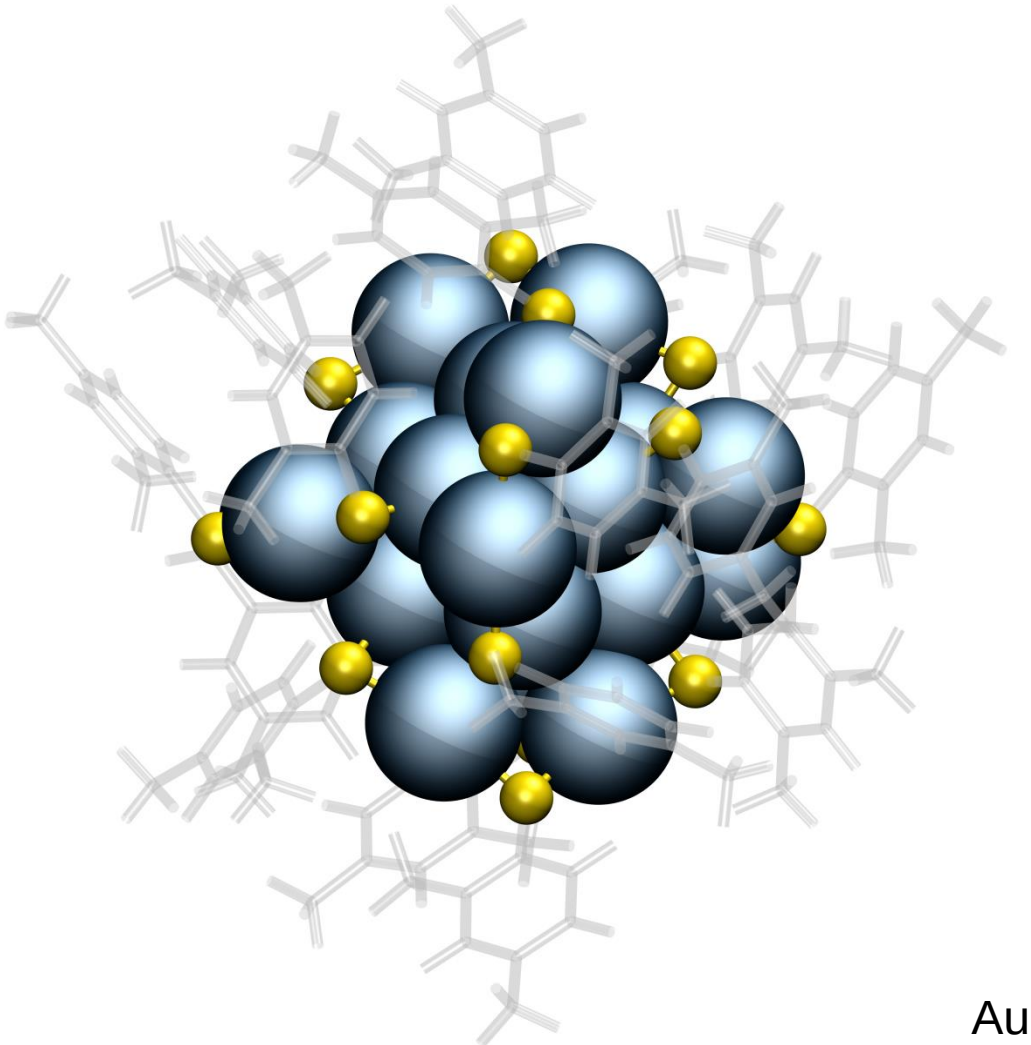
low-cost nanostructured electrodes which interact directly with enzyme (e.g. graphene or CNT).

Designs of the proposed arsenic sensing devices



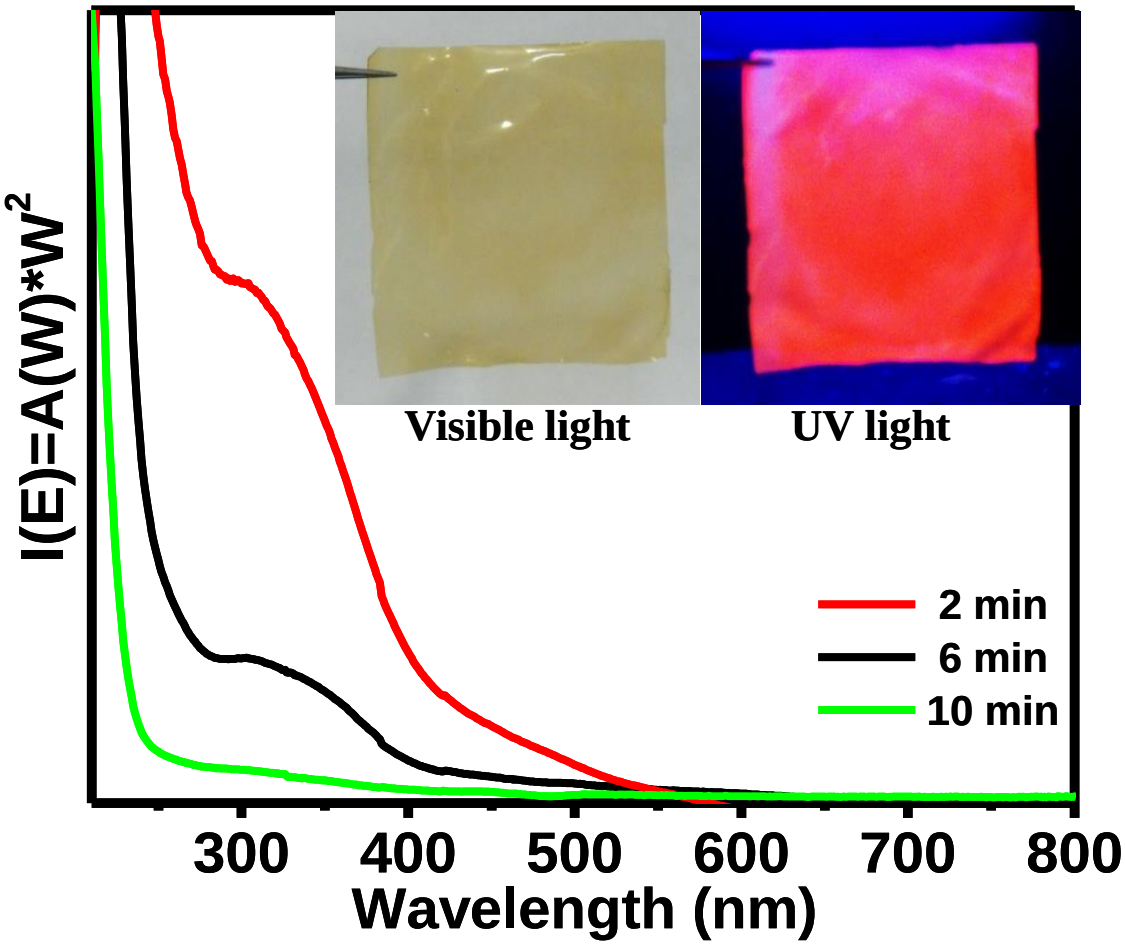
Concept designs of the in-line sensing system and a handheld reader

Data from India-UK collaborative project on the development of In-line arsenic sensing device.



Au_{25}, Ag_{25}

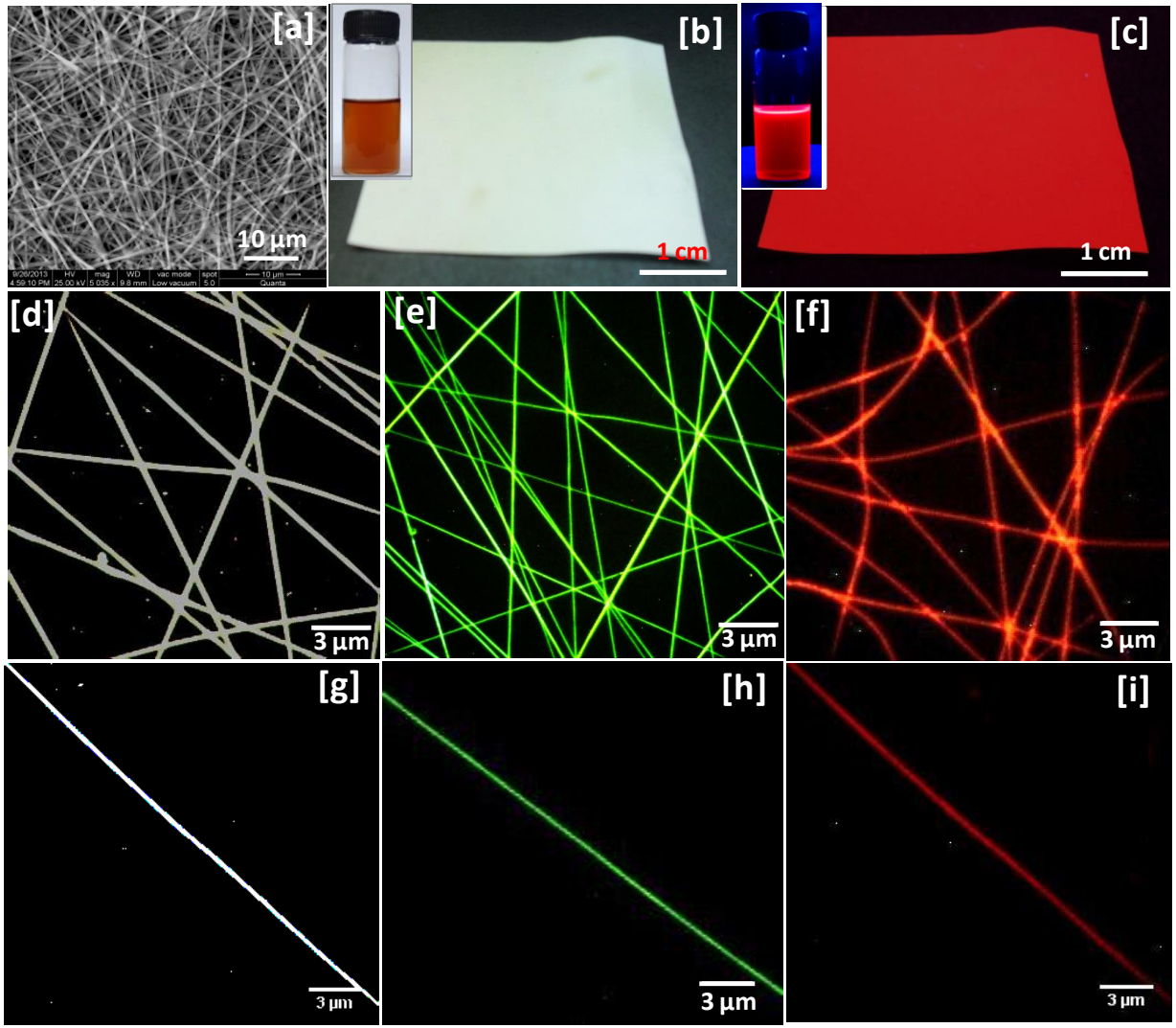
Quantum cluster based metal ion sensing paper
Large area uniform illumination using quantum cluster



Decrease in the absorption of Au_{15} as a biofilm is dipped into the cluster solution. Inset: Free standing quantum cluster loaded film in visible light and UV light.

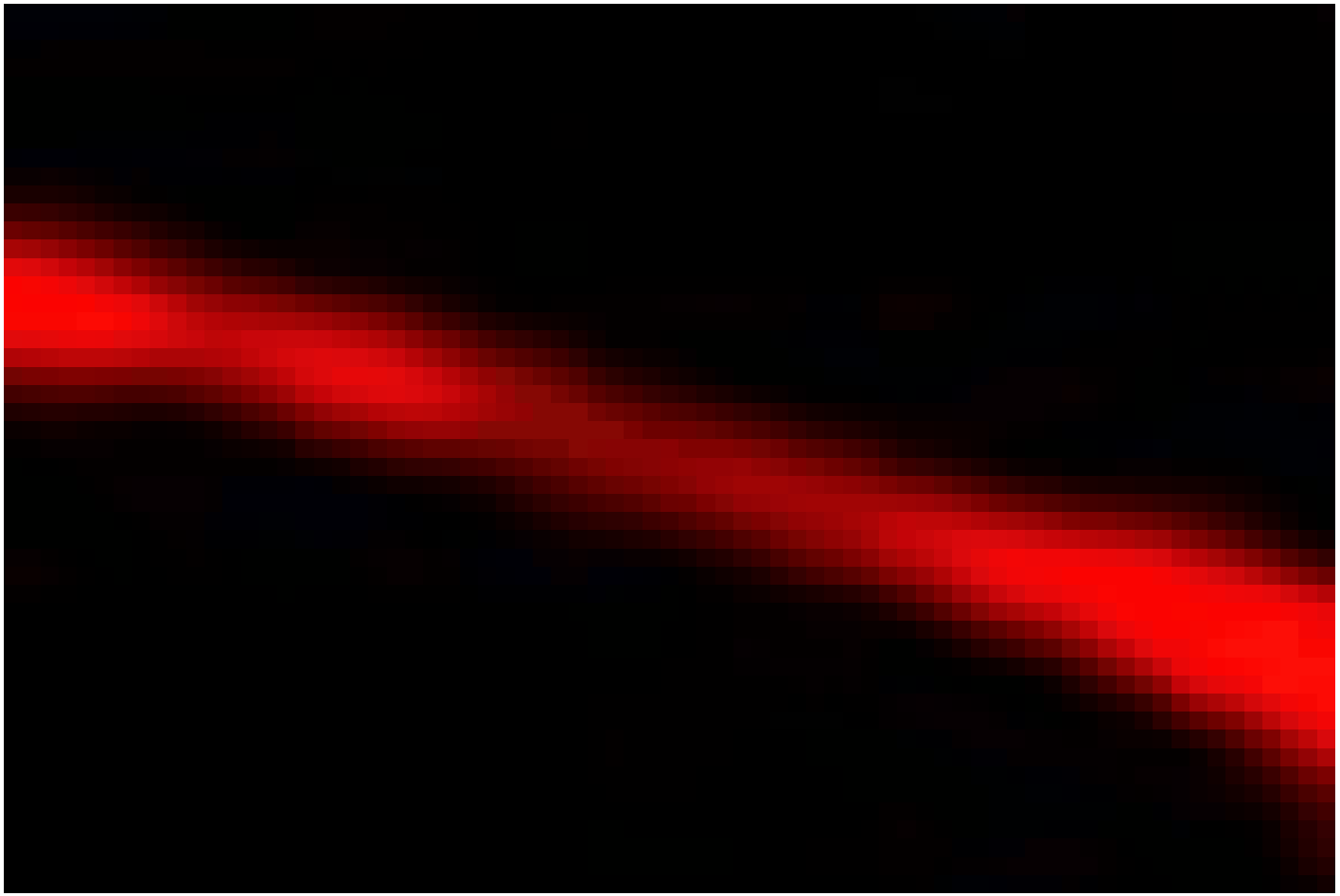
Anu George et al. *ACS Applied Materials & Interfaces*, 2012

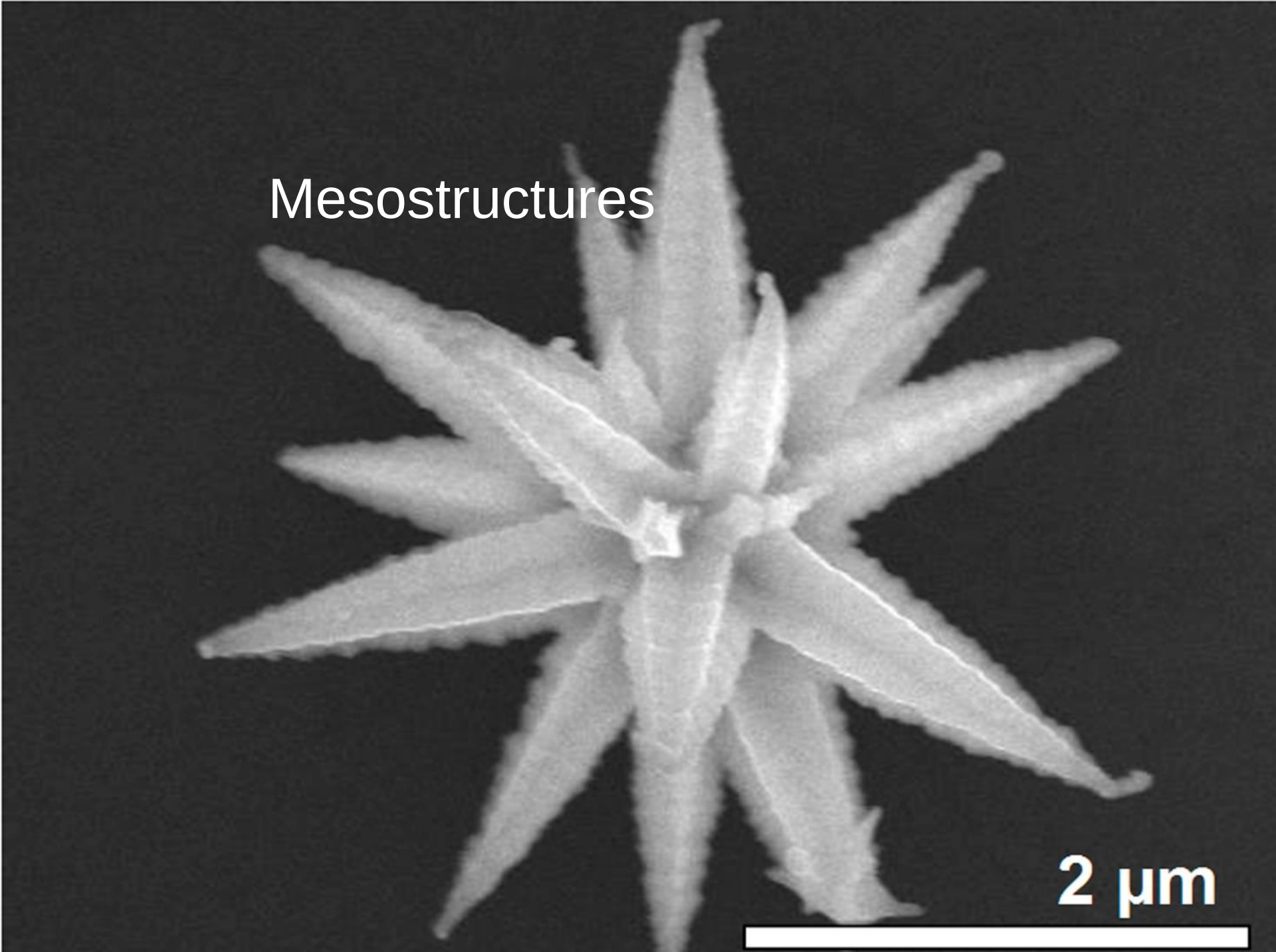
Approaching detection limits of tens of Hg^{2+}



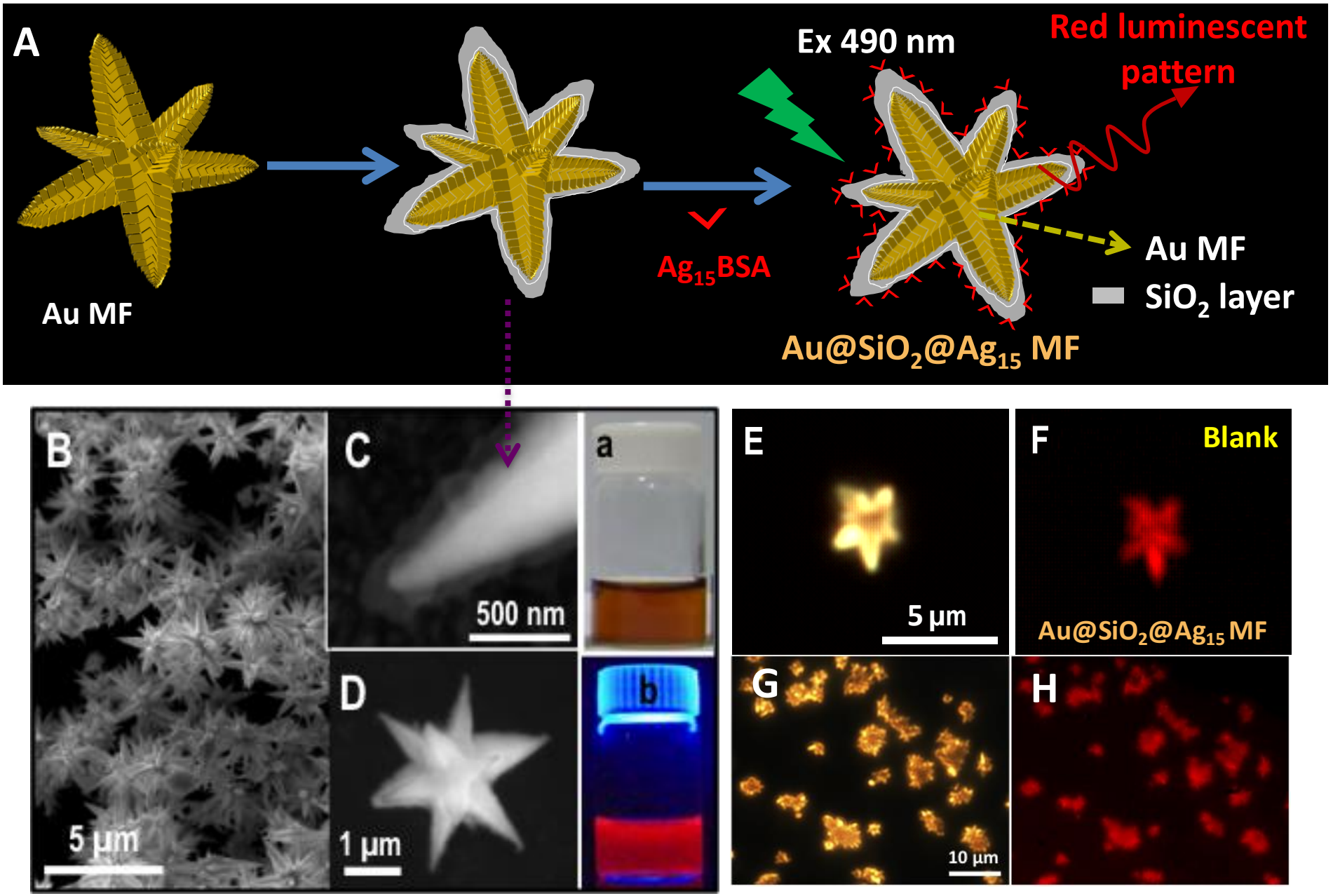
Atanu Ghosh et al. Anal. Chem. 2014.

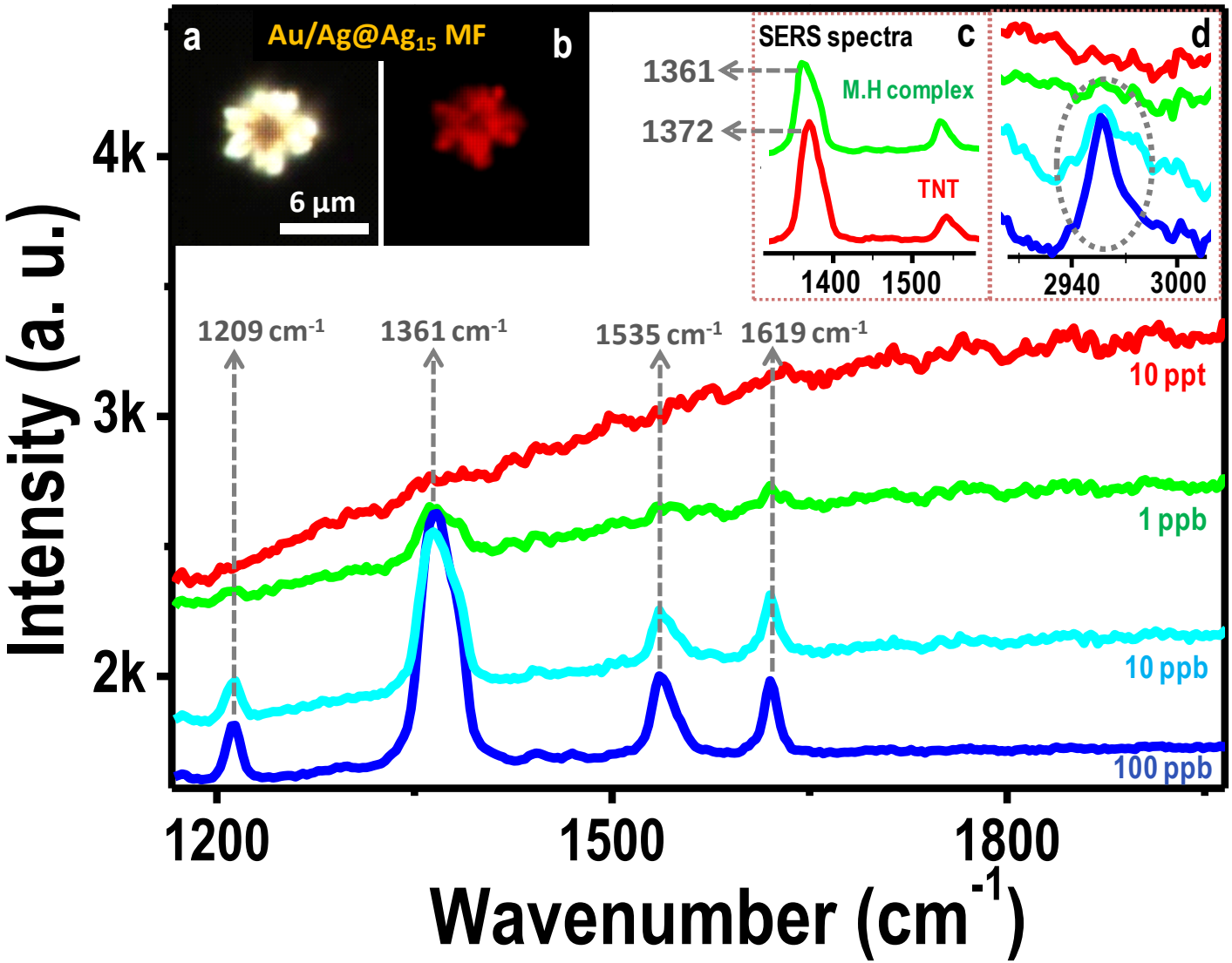
Video of mercury quenching experiment using the nanofiber




Mesostructures
2 µm

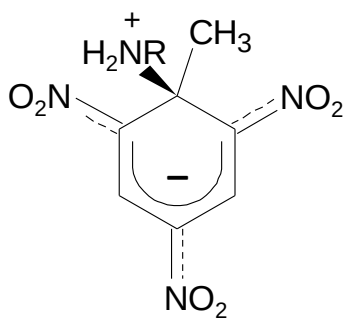
Designing a sensor





Meisenheimer complex

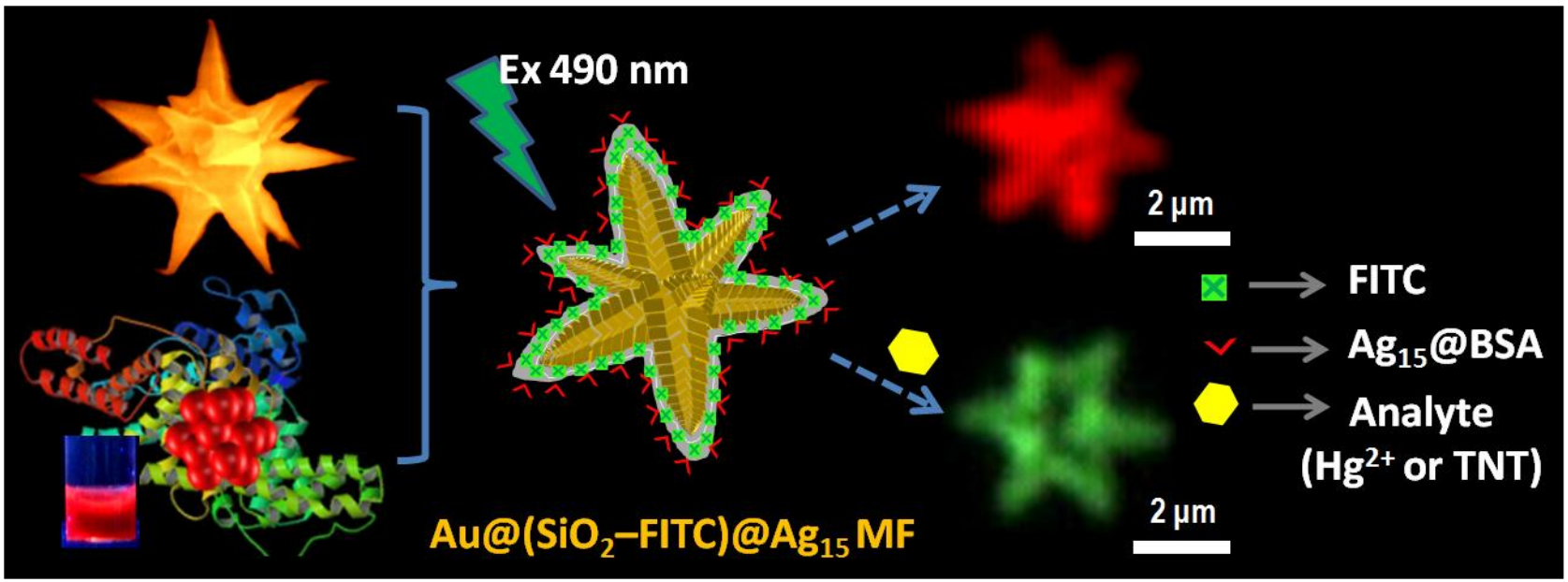
TNT

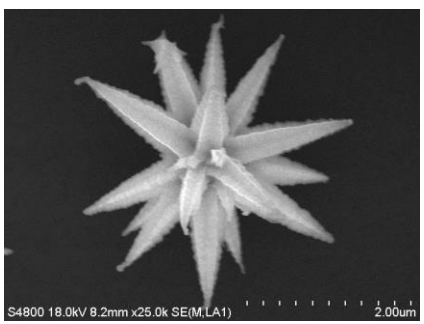


Meisenheimer complex is formed easily due to charge delocalization

Raman spectra showing the gradual evolution of TNT features as the concentration of TNT added to Au/Ag@Ag15 MFs (a and b) increases. (c) Comparison of the symmetric and asymmetric NO2 stretching bands in the SERS spectra of TNT before (black) and after Meisenheimer complex formation (gray). (d) The gradual appearance of a Raman band at 2960 cm^{-1}.

Sub-zeptomolar detection

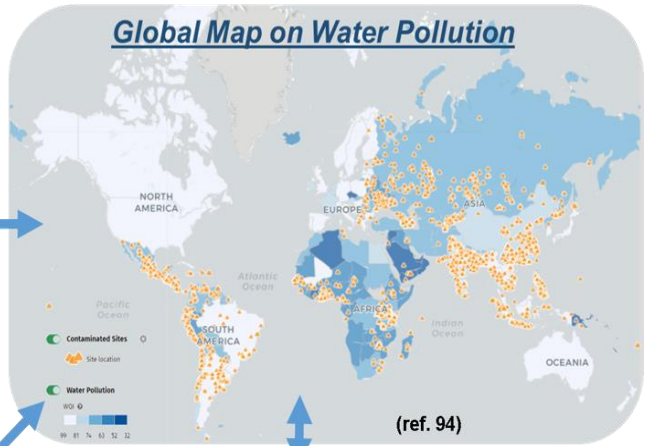


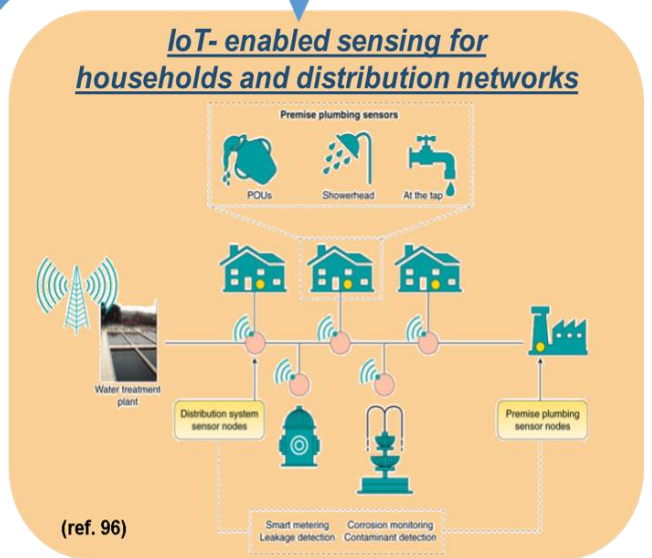


Featured in:
The Hindu, Telegraph, Times of India, etc.
C&E News
and many others

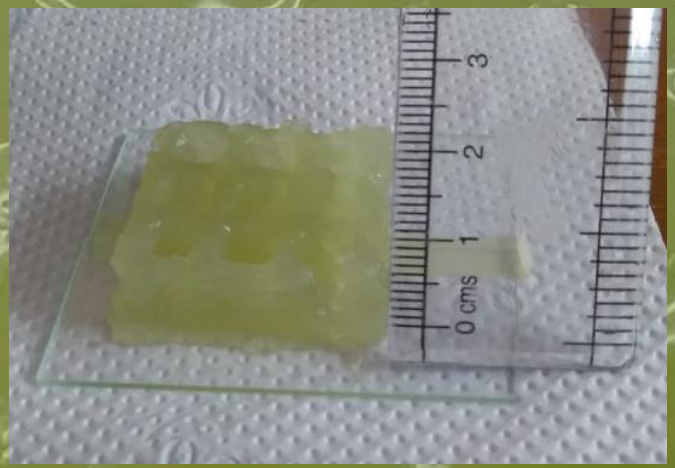
Ammu Mathew, et al. Angew. Chem. Int. Ed. 2012

Smart water purifiers and big data





Ankt Nagar and T. Pradeep, *ACS Nano* (perspective) in revision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