SYNTHESIZING MULTIFUNCTIONAL NANOCOMPOSITES FOR THE REMOVAL OF VALUABLE AND TOXIC METAL IONS FROM ALONG WITH WATER-BORNE MICROBES FROM CONTAMINATED WATER

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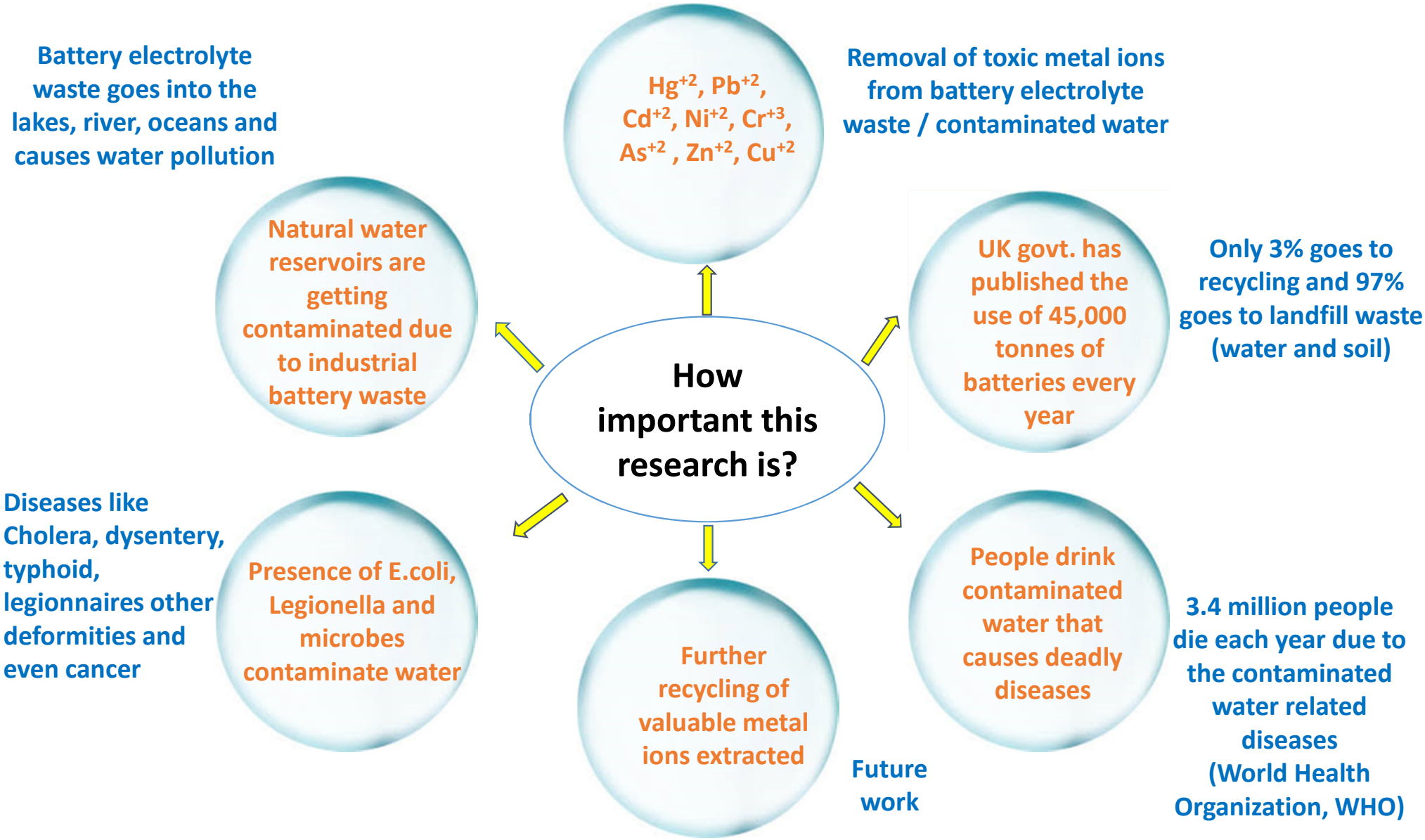
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How important this research is?
Hg^{+2}, Pb^{+2}, Cd^{+2}, Ni^{+2}, Cr^{+3}, As^{+2} , Zn^{+2}, Cu^{+2}
Removal of toxic metal ions from battery electrolyte waste / contaminated water
UK govt. has published the use of 45,000 tonnes of batteries every year
Only 3% goes to recycling and 97% goes to landfill waste (water and soil)
People drink contaminated water that causes deadly diseases
3.4 million people die each year due to the contaminated water related diseases (World Health Organization, WHO)
Further recycling of valuable metal ions extracted
Future work
Presence of E.coli, Legionella and microbes contaminate water
Diseases like Cholera, dysentery, typhoid, legionnaires other deformities and even cancer
Natural water reservoirs are getting contaminated due to industrial battery waste
Battery electrolyte waste goes into the lakes, river, oceans and causes water pollution

Introducing UK-India Project based on the the separation of toxic and microbial contaminants from water

Task Management
IACS, Kolkata, India

Task Management
at UCLan , Preston, UK



Dr. Dhurjati Kumar



Piyali Bhanja



Prof. Asim Bhaumik
Indian project lead
Academic organisation



Dr. Tapas Sen
UK project lead
Academic organisation



Qurban Ali



Amrit Kaur

Task Management
Tata, Pune

Task Management
Feedwater Ltd. UK



Dr Nawal K Mal
Industrial partner, India

Research and development *via* knowledge

Know -how, exploitation and commercialisation

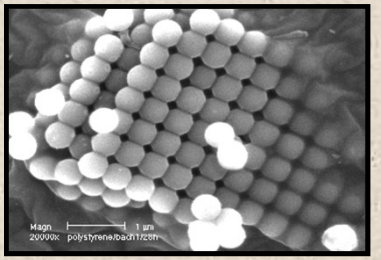


Mr Gary Hogben
Industrial partner, UK

Research background

Biomimetic synthesis by templating method

Surfactant : Co-surfactant : H_2O : HCl : TMOS



Gel

15min, RT
Filter

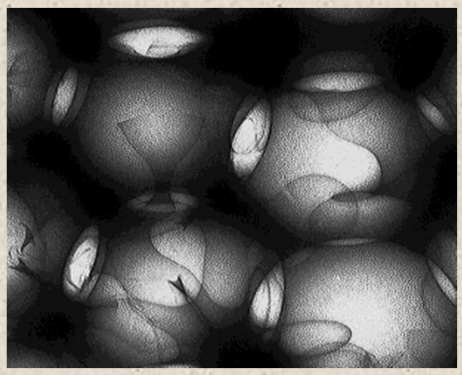
Air space filled with a gel

Dried at 60^{0}C

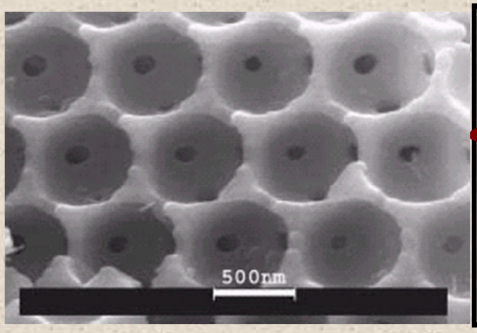
Resultant material

Toluene Extraction

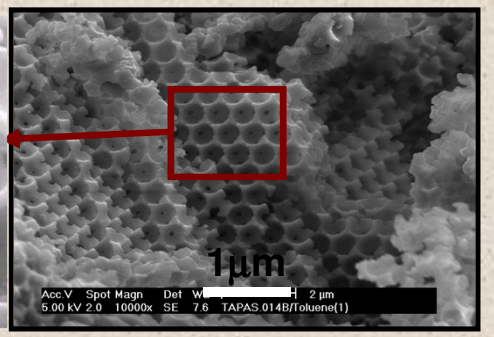
Calcination 550^{o}C for 8 hrs.



TEM image Sen et. Al.



Macropores with interconnecting windows

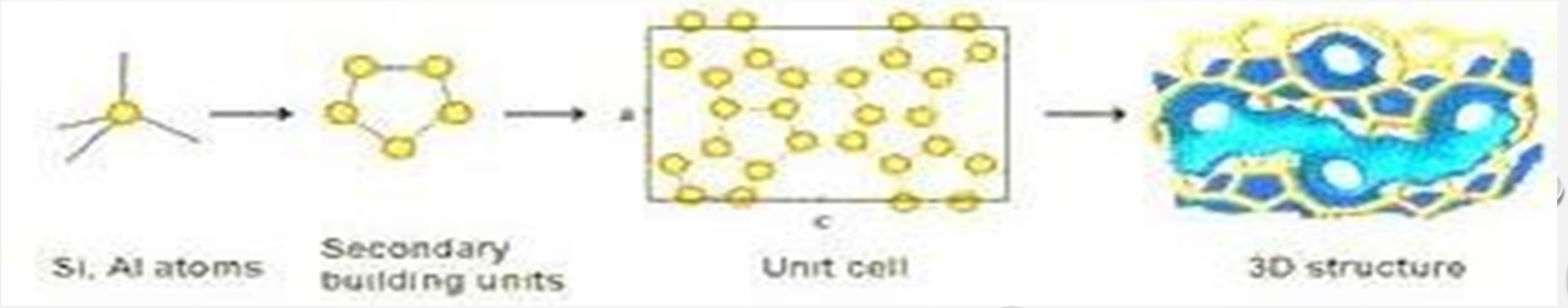


Porous silica

Sen *et al.* Angew. Chem. Int. Ed. Eng. 42, **2003**,4649, Chem. Mater. 16, **2004**,2044

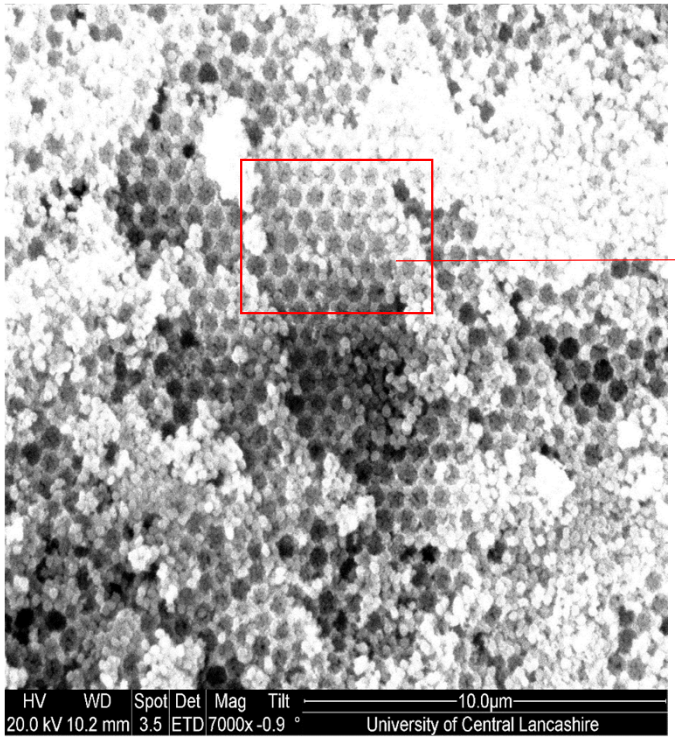
Work Done to prepare novel materials

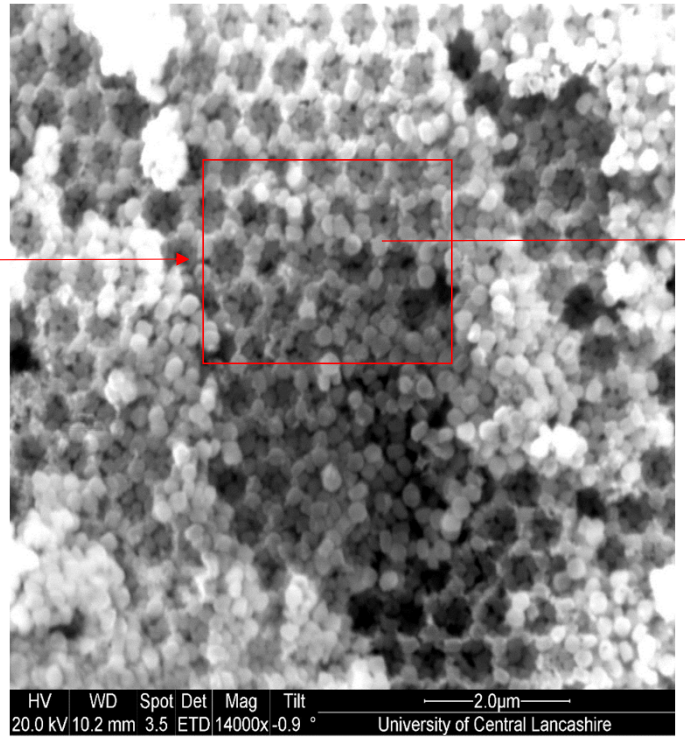
- A work has done to synthesize porous materials with crystalline wall structures
- A part of research work has been accomplished to synthesize nanocomposites using nanocrystalline zeolites as building blocks

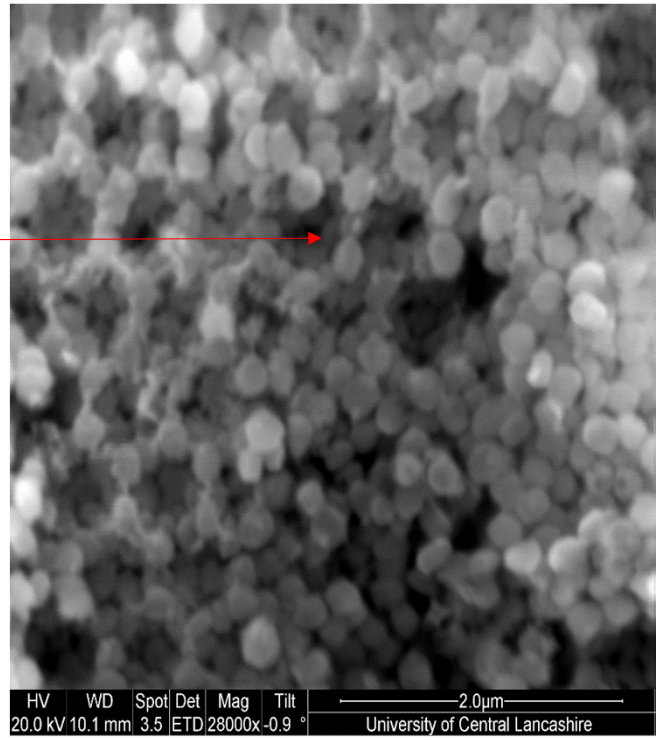


S. J. Reitmeier, *Investigation of hydrocarbon transport phenomena on surface modified H-ZSM5 zeolites*, University of Technology, Munich, Munich, 2009

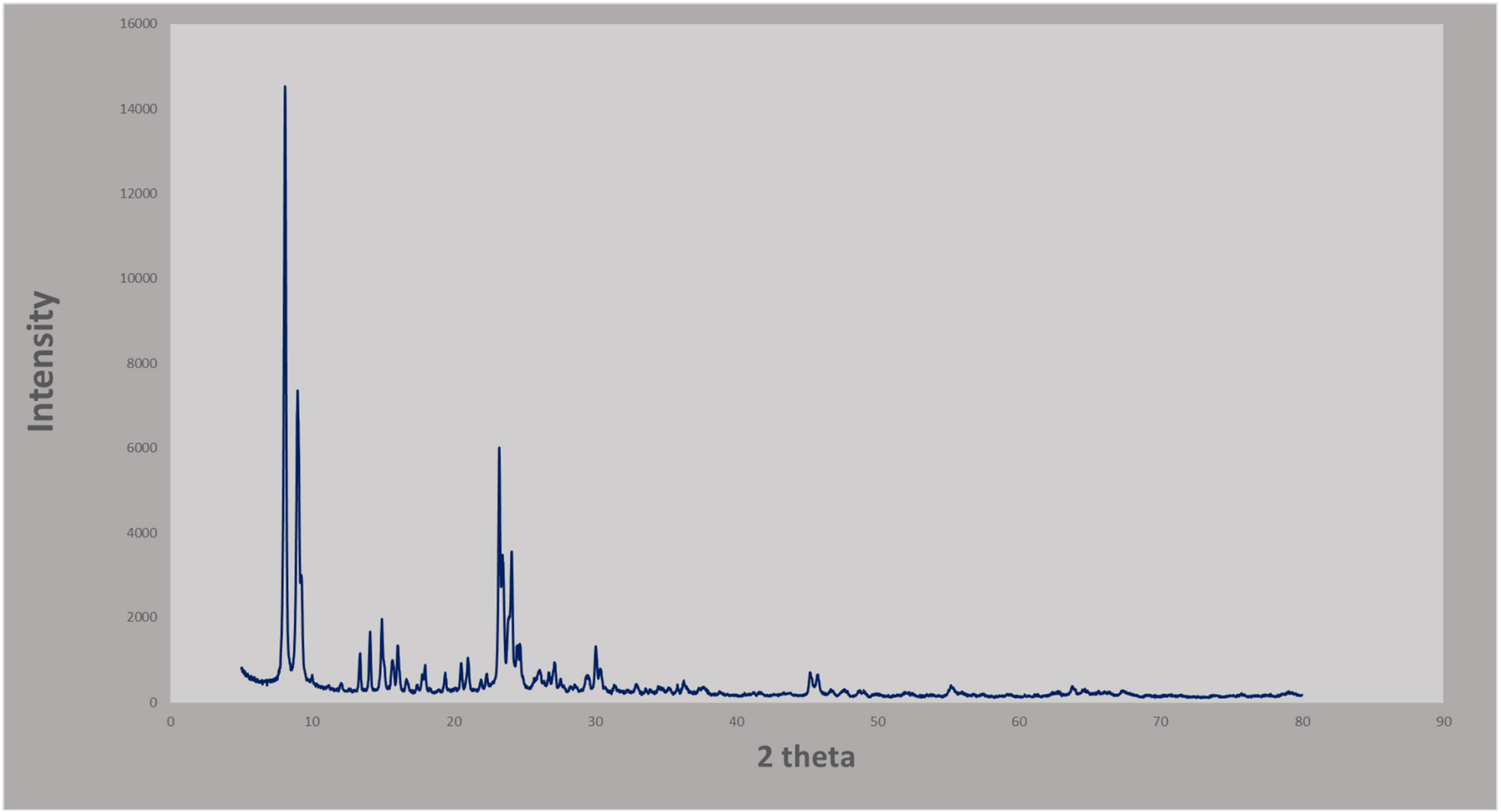
Scanning Electron Microscope (SEM): To verify the porous structure



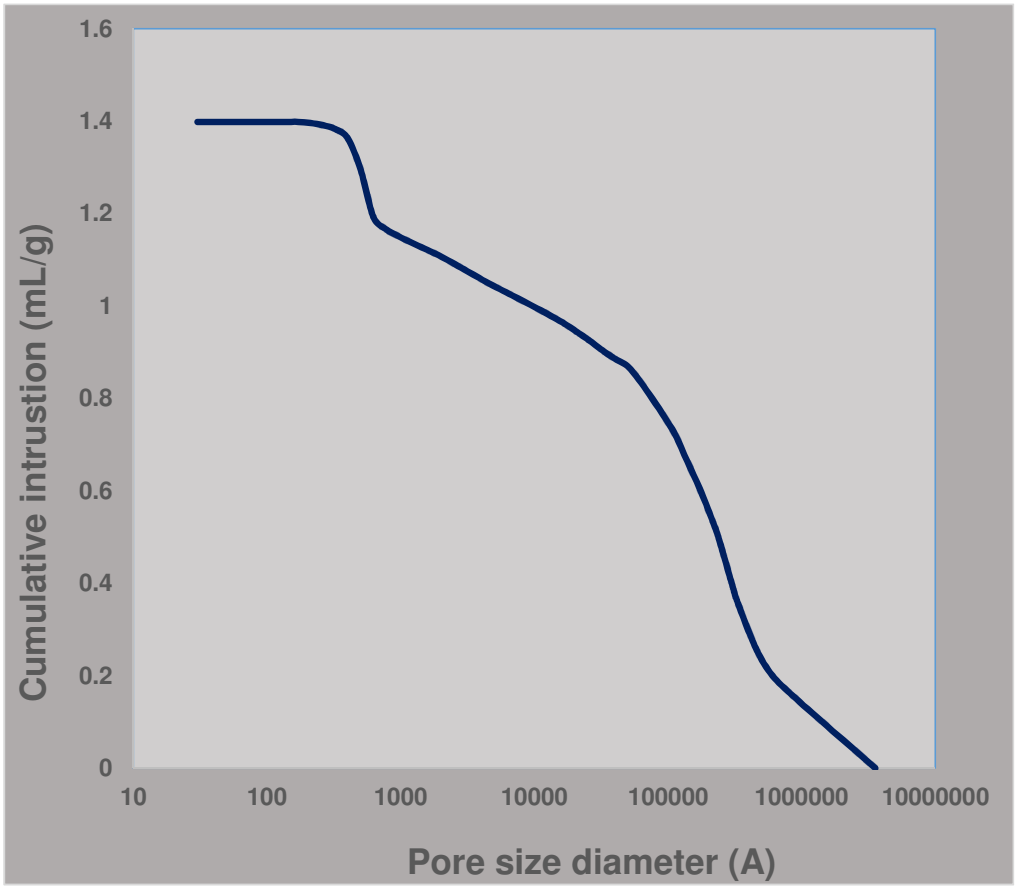


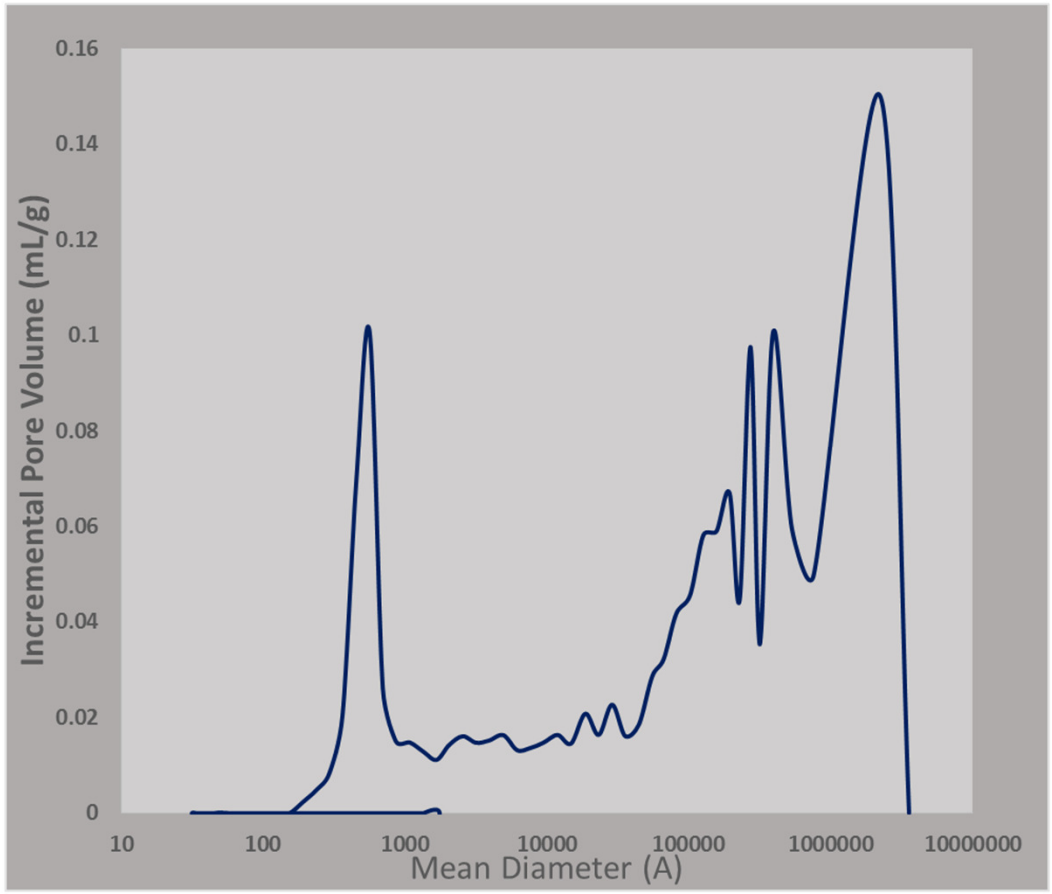


X-ray Diffraction: To verify the crystalline nature

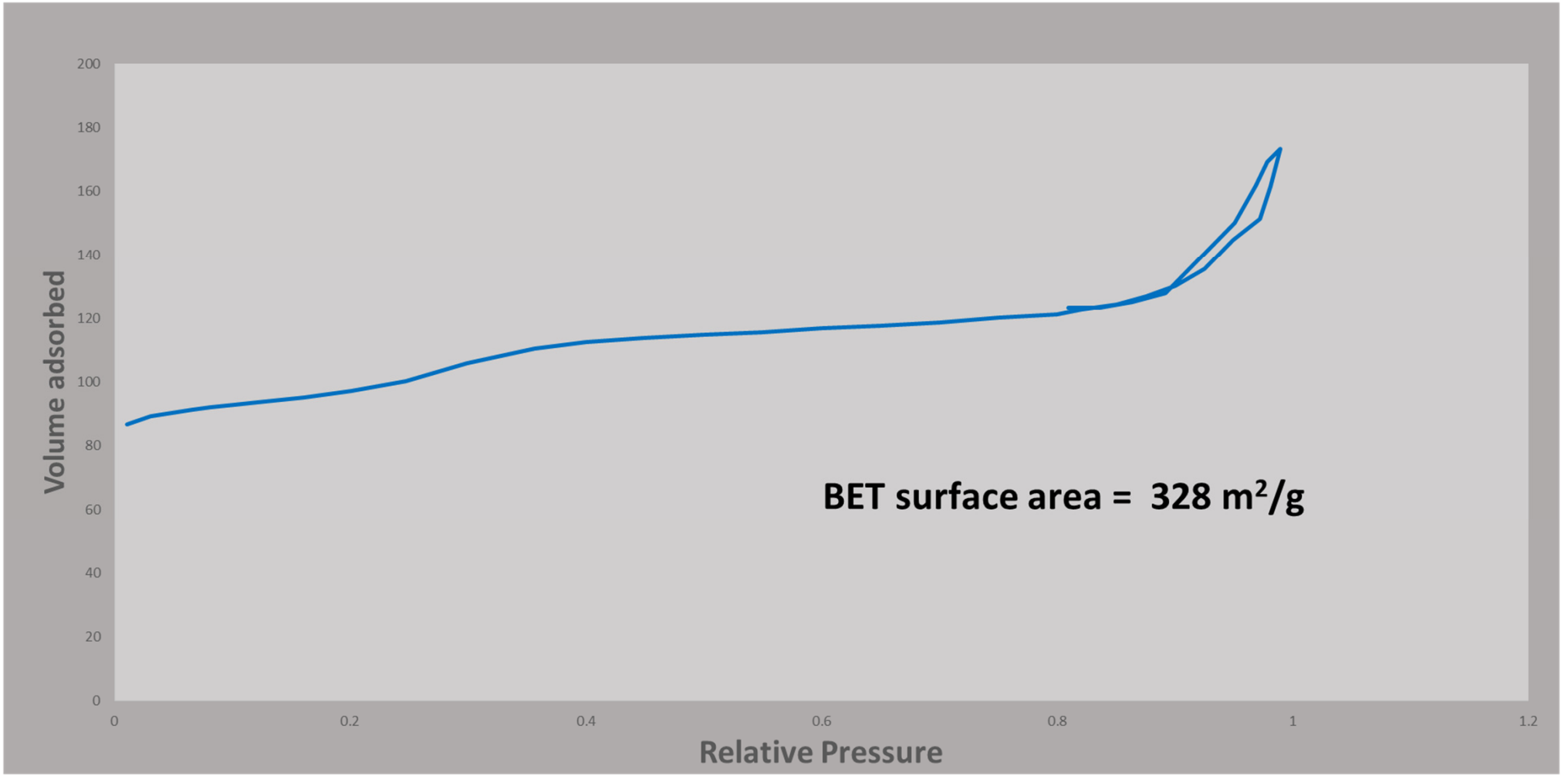


Mercury porosimetry: To determine the porosity

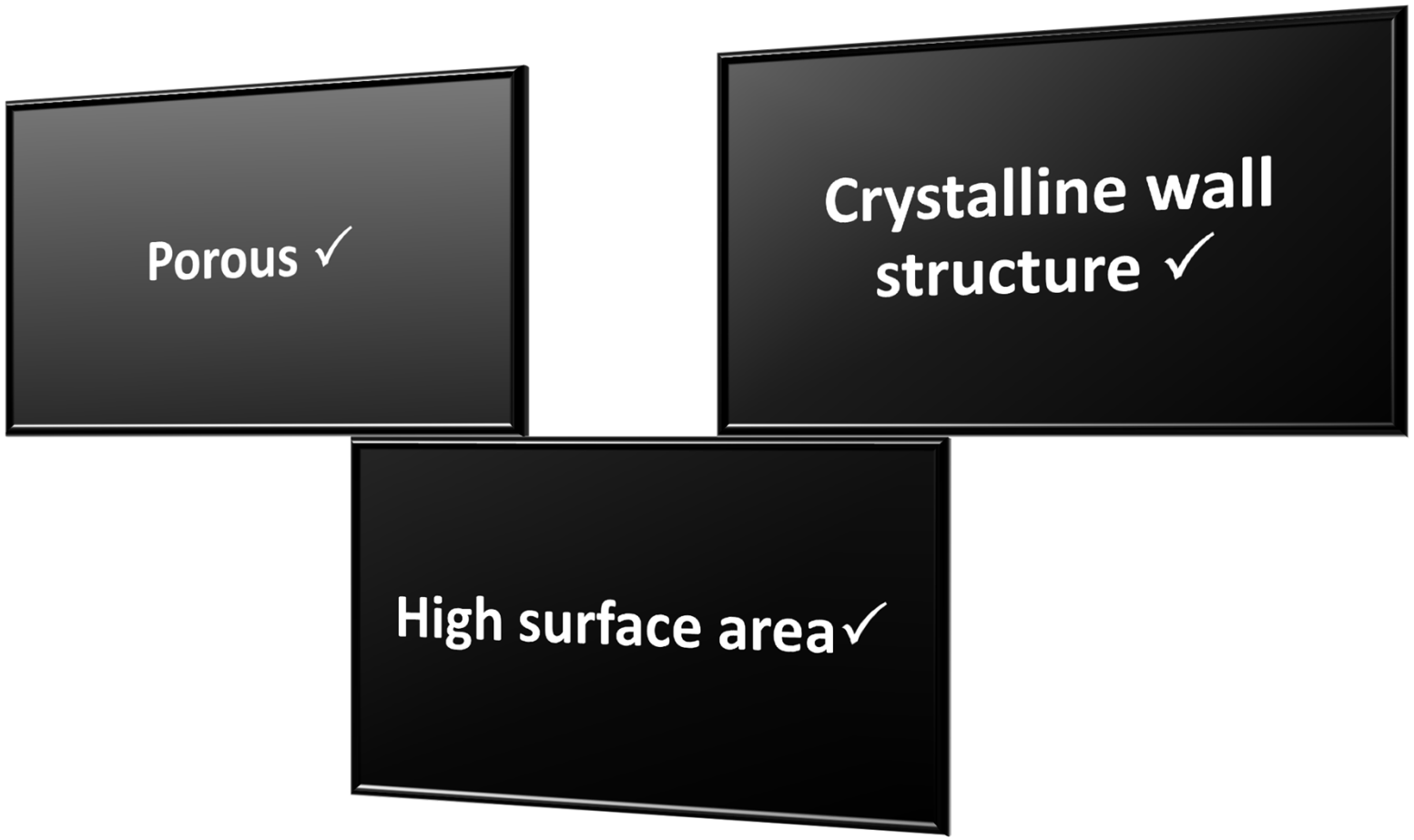




Nitrogen adsorption (BET surface area): To determine the surface area



CONCLUSION



FUTURE WORK

To synthesize novel multifunctional Nanocomposites by:

- Hierarchical ordered structure
- Superparamagnetic properties

❖ Surface functionalization using DNA primers for capturing water-borne microbes

ANY QUESTIONS?

THANK YOU