Sensor, Photocatalysis and Anti-Bacterial Applications of Novel Metal/ Metal Oxide Nanocomposites

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Metal/metal oxide nanocomposites are being extensively studied as a potential sensor, catalysis and anti-bacterial agent. The activity of nanomaterial changes with several factors including size, morphologies and crystal growing. [1,2] The self-assembled nanostructured materials (including Ag•$NiMn_2O_4$ and Ag•$SrSnO_3$ NRs) are promising sensor, photocatalyst and anti-bacterial agent against MDR bacteria.[1-5] These materials have been used for the fabrication of sensor probe for the detection and quantification of the environmental toxins (e.g., phenylhydrazine, bis-phenol A) in a very small quantity (nM-pM) level. These oxides have been promising for degrading dyes efficiently in waste water. The metal/ metal oxide nanomaterials have been applied for studying anti-bacterial activity against pathogenic bacteria including both Gram positive and Gram negative one, in presence and absence of light and compared with the standard antibiotic. The metal oxide nanocomposites are effective against multi-drug resistant (MDR) bacteria both in presence and absence of light. The excitation of the nanocomposite by light and formation of the radicals like reactive oxygen species (ROS) prompted bacteria killing through the ROS mechanism. The minimum inhibitory concentration (MIC) is defined as the lowest concentration of a compound that will completely inhibit the visible growth of microorganisms after overnight incubation. Minimum Bactericidal Concentration (MBC) is the lowest concentration of an anti-bacterial agent required to kill a bacterium under a certain set of conditions over a specified, quite prolonged period of time, such as 18 hours or 24 hours. The MIC and MBC of the nanocomposite against MDR bacteria have been evaluated to identify the minimum effective dose required. The self-assembled nanostructured are auspicioussensor, catalyst and anti-bacterial agent against MDR bacteria as well as an industrial sterilization system.[1-5]

Biography:

Md Abdus Subhan received his PhD from Osaka University, with Japanes Government Monbusho Scholarship (Recommended by Bangladesh Government). Currently he is a Professor at Shah Jalal University of Science and Technology, Sylhet, Bangladesh. He held several postdoctoral positions in different countries including VBL (venture business laboratory) fellowship in Materials and Life Science, Faculty of Engineering, Osaka University, Japan; BK 21 postdoc fellowship in Seoul National University and NRF (National Research Foundation, South Korea) postdoc fellowship Andong National University, South Korea and Fulbright Visiting Scholar fellowship in Northeastern University, Boston, MA, USA. His current research field is nanomaterials, nanomedicine and drug delivery. He has a great contribution in sensor, catalytic, optical and drug delivery research using nanomaterials, which is reflected in his published papers in recent years. He has published 66 papers with many appearing in the high-impact journals. He has strong track record (h-index 15, i10 index 28).

References:

1. Subhan, M. A. et al., (2019). New J. Chem.,43, 10352.
2. Subhan, M. A. et al., (2020). Journal of Environmental Chemical Engineering, 8, 104051.
3. Subhan, M. A. et al., (2020). RSC Advances, 10(19), 11274-11291.
4. Subhan, M. A., et al., (2018), New J. Chem.,42, 872.
5. Subhan, M. A., et al., (2021), New J. Chem.,Advance article. https://doi.org/10.1039/D0NJ04813E.