

Development of Boron based nanomaterials for Boron Neutron Capture Therapy

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**Chemistry
Seminar on
Boron Neutron
Capture Therapy**

**Monday
Feb. 5 at 4 pm
in 303
Schrenk**

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Abstract: This seminar looks into the exciting field of boron-based nanomaterials used for boron neutron capture therapy (BNCT), a targeted chemo-radiotherapeutic technique. BNCT effectively targets tumor cells by delivering ^{10}B -enriched compounds to the cancer cells without damaging healthy cells. Currently, only two compounds, namely L-BPA (L-p-boronophenylalanine) and BSH (boronocaptate sodium), are clinically used for BNCT. Hence, global research efforts are dedicated to discovering more effective and efficient boron agents.

Through extensive research, we unveil three distinct materials: water-dispersible boron nitride (^{10}BN) nanoparticles, boron carbide quantum dots (B_4C QDs), and boron carbon nitride (BCN). Our findings showcase the unique properties of ^{10}BN , emphasizing its low toxicity and significant anti-tumor effects, marking it as a promising candidate for BNCT applications. The B_4C QDs, with enhanced fluorescence intensity in tumor cells, offer a compelling alternative to conventional boron agents and potential for tumor detection also. Additionally, BCN emerges as a noteworthy contender with its highly soluble nature, hexagonal structure, and promising anti-tumor effects, surpassing previous studies on boron materials. Our exploration extends to the implications of these nanomaterials in BNCT, presenting a compelling case for their utilization in the selective targeting and treatment of cancer cells through neutron irradiation. Join us in uncovering the future of cancer therapy through the development of these cutting-edge boron-based nanomaterials, promising new horizons for BNCT.

About the speaker: Dr. Akshay Kumar is working as the Associate Dean Research and Associate Professor (Physics) at Sardar Patel University in Himachal Pradesh, India. Furthermore, he presently serves as a SERB-SIRE Fellow (Visiting Professor) at Missouri University of S & T, USA, overseeing a six-month Govt. of India funded research project. He earned his MSc degree in Applied Physics in 2005 and his PhD from the School of Physics and Material Science, Thapar University, India, in 2011. Dr. Kumar has also served as Faculty and Head in the Department of Nanotechnology at SGGSW University, India for more than 10 years. He successfully supervised the research work of 10 PhD candidates and over 50 Master's students. He has broadened his research team, encompassing members in both South Korea and Japan. His contributions to the field are reflected in the publication of more than 100 research articles in esteemed international journals. His research interests include synthesis of nanomaterials, structure-property relation, photodetectors, chemical gas sensors and boron neutron capture therapy (BNCT). He has undertaken the role of a reviewer for multiple funding agencies in both Asia and Europe, in addition to serving as a reviewer for prestigious journals. Concurrently, he works as a research consultant for sensor industries in India. His impactful contributions have resulted in receiving research grants exceeding INR 10 million from different funding agencies.