

**Symposium on Undergraduate Nano-Education:  
"Addressing the Challenges of Nanoscale Science & Engineering Education"**

**Presentation:**

"Basic Physics Behind The Size Dependent Properties of Nanoparticles"

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**Presenter Biography:**

Ashok Mody is a condensed matter physicist and actively involved with undergraduate and postgraduate teaching. He is a faculty at Mithibai College, University of Mumbai, India for more than 25 years. His main interest is to motivate the students for learning physics at school and undergraduate level. He is involved in the activity to popularize the science. He has been instrumental in organizing the workshops/seminars for students and teachers at various levels. Nano Science and Physics Education are the upcoming fields in India and he would like to bring the awareness about both the fields in students and the teachers. He is the Secretary of Indian Physics Association, Mumbai chapter.

Presently, he is a Post Doctoral Research Fellow working with Physics Edu. Research Group of Prof. Dean Zollman at KSU. He is associated with the center for Nanostructured Materials for Indoor Air Quality and working on the development of course modules/instructional materials for existing courses related to air quality and nanoscale science and technology.

**Abstract:**

Nanoscience is the study of phenomena on the scale of about 1 to 100 nm. Biologists, chemists, physicists and engineers are involved in the study of particles at nanoscale, i.e., nanoparticles. Scientists have used tools such as Scanning Tunneling Microscope (STM) and Atomic Force Microscope (AFM) to study the behavior of these nanoparticles and have observed that these particles are of great scientific interest as they are bridging the gap between material particles at atomic level and material at bulk level. Nanoparticles show physical and chemical properties that are different from those exhibited by the material of same type at bulk level. Introducing students to nanoscience is an exciting task for teachers. The challenge for teachers is- how to relate basic physics concepts in understanding the different properties exhibited by nanoparticles.

This paper discusses the size dependent properties of nanoparticles. Such properties include color, specific heat, melting point etc. The paper attempts to relate these properties to basic physics concepts, including electromagnetic force, van der Waal's force, etc. and also provide some understanding on what happens to the number of atoms on the surface when we move from bulk to nano. It also shows how the surface-area-to-volume ratio becomes significant in the study of nanoparticles.