



## ZnO Quantum Dots in SBR Latex for Methanol Sensing

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### Abstract

We report methanol sensing behavior of zinc oxide (ZnO) quantum dots embedded in styrene butadiene rubber (SBR) latex. ZnO quantum dots are prepared via chemical route where bulk ZnO powder is sintered at very high temperature of 1200°C and then quenched into 100 ml double distilled water into which an SBR latex coated glass substrate is put into the water for one hour and then taken out. The milky white film on glass substrate consists of ZnO quantum dots. The prepared specimen are analysed by various techniques and it is revealed that the sizes of the samples are within 12 nm. Further, prepared ZnO samples have been tested for sensing methanol vapour by exploring the variation of its resistance with time at different operating temperatures ranging upto 360°C.

**Keywords :** ZnO Quantum Dot, SBR Latex, Quenching, Methanol Sensing.

### Introduction

Synthesis of nanoparticles and their various applications in different areas are drawing the interest of many researchers at present. Nanoparticles are finding their applications in different areas of science as electronic device (e.g. Electronic switch) and photonic device (nano light emitting device) and sensing device (as gas sensor) (Zhang et al, 2006; Nath et al, 2008; Janben et al, 2008; Nath et al, 2009; Nath et al, 2008;

Mohanta et al, 2002). Different preparation techniques e.g. ion beam deposition, radio frequency sputtering (RF), chemical route etc. are adopted to synthesize semiconductor quantum dots. Due to various advantages viz. simplicity, low cost, chemical method draws the interest of recent researchers. In the present article, we discuss fabrication of ZnO quantum dots embedded in styrene butadiene rubber (SBR) latex matrix by chemical route and study of their methanol vapour (gas) sensing property. ZnO is

attractive semiconductor for methanol sensing because of its high chemical response to methanol. ZnO samples have been characterised by different techniques to explore the properties of prepared samples (Nath et al, 2008; Nath et al, 2009). These studies infer the formation of quantum dot particles within the dimension of 12 nm. Next, the methanol vapour (gas) sensing property of the sample has been examined by exploring the changes ZnO specimen with time due to the presence of methanol vapour (Nath et al, 2009; Vaishnav et al, 2005; Sahay et al, 2008). Gas (vapour) sensing property of semiconductor is purely a surface phenomenon (Nath et al, 2009; Vaishnav et al, 2005; Sahay et al, 2008; Nogami et al, 2009; Gong et al, 1999; Peng et al, 2008; Zhang et al, 2008; Hulser et al, 2005; Chou et al, 2006; Shouli et al, 2008; Choudhury et al, 2010; Sahay et al, 2005). That is why, low dimensional specimen, possessing large surface area to volume