



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Tunable Photoluminescence and Visible light Photocatalysis by Mesoporous Si Nanowires Array and its Heterostructures**

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SHORT ABSTRACT

This thesis presents a systematic study on the growth mechanism, orientation controlled growth and tunable photophysical and photochemical properties of mesoporous Si NWs and its HSs for light emission and environmental cleaning applications. The complete thesis work has been organized into nine chapters. The present chapter i.e., **Chapter 1** presented a brief summary of the latest developments in 1D Si NWs, including growth strategies, important properties and their promising applications ranging from LED, solar cells, sensors, and energy storage to photochemical reactor. **Chapter 2** provides a brief description of the experimental techniques used for the present work along with the working principles of some characterization tools. **Chapter 3** presents results on the early stages of growth and growth mechanism of Si NWs using MACE process through a scaling approach. The controlled fabrication of Si NWs by tuning the growth parameters is described elaborately in this chapter. The origin of the broad band visible-NIR PL from the as-grown Si NWs decorated with Si NCs of arbitrary shape is discussed in **Chapter 4**. **Chapter 5** presents a quantitative analysis of the phonon confinement effect in arbitrary shaped Si NCs decorated on Si NWs and its correlation with the PL analysis. Visible light photocatalysis by mesoporous is described in **Chapter 6**. In **Chapter 7**, PL signature of resonant energy transfer in ZnO coated Si NWs/NCs array is presented. **Chapter 8** presents the results of fabrication, properties and applications of metal NPs decorated Si NWs. The highlights of the major contributions of the thesis, important conclusions of the present work and scope for future studies on Si NWs and its HSs are discussed in the last chapter i.e. **Chapter 9**.

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