

**Physicochemical and Electrochemical  
Characterization of Alternative Anode Material,  
 $\text{Li}_4\text{Ti}_5\text{O}_{12}$  by Solid State Route**



*Submitted by:*

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In partial fulfillment of requirements for the award of degree in

**M.Tech (Nano Science & Technology)**

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*Under the guidance*

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## CERTIFICATE

This is to certify that **Sandip Kumar (Roll No. 2K14/ NST/11)** has successfully completed project work on “**Physicochemical and Electrochemical Characterization of Alternative Anode Material,  $\text{Li}_4\text{Ti}_5\text{O}_{12}$  by Solid State Route**” in partial fulfillment of requirements of the M.Tech in Nano Science & Technology of Delhi Technological University under the supervision and guidance of **Dr. Amrish K. Panwar**, Assistant Professor, Applied Physics department.

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## **DECLARATION**

I hereby declare that the work presented in this dissertation entitled “**Physicochemical and Electrochemical Characterization of Alternative Anode Material,  $\text{Li}_4\text{Ti}_5\text{O}_{12}$  by Solid State Route**” has been carried out by me under the guidance of **Dr. Amrish K. Panwar, Assistant Professor** and hereby submitted for the partial fulfillment for the award of degree of Master of Technology in Nanoscience and Technology at Applied Physics Department, Delhi Technological University (Formerly Delhi College of Engineering), New Delhi.

I further undertake that information and data enclosed in this dissertation is original and has not been submitted to any University/ Institute for the award of any other degree.

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## **ABSTRACT**

As the demand for better, lighter and more efficient microelectronic portable devices increases, the development of lithium ion batteries as power sources with high performance becomes essential. Within this frame work, alternative  $\text{Li}_4\text{Ti}_5\text{O}_{12}$  (LTO) anode materials has been prepared and characterized to assess its better electrochemical performance. Synthesis of LTO through solid state route is considered as economical, efficient and easy way for the mass production. Therefore, spinel type LTO is prepared using solid state reaction route. Further, the different physio- chemical characterization such as SEM, XRD, cell performance, and calculation for LTO has been performed to confirm the proper phase and structural formation. To optimize performance of lithium ion batteries in terms of good cycle ability, capacity and power density during the electrochemical analysis of batteries.