DELHI TECHNOLOGICAL UNIVERSITY

CERTIFICATE

This is to certify that **Abhishek Kumar Singh (Roll No. 2K13/NST/03)** has successfully completed project work on "**Synthesis and Characterization of Alternative Anode Material, $Li_4Ti_5O_{12}$ by Solid State Route"** in partial fulfillment of the 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**, Department of Applied Physics, DTU.

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DECLARATION

I hereby declare that the work presented in this dissertation entitled **"Synthesis and Characterization of Alternative Anode Material, $Li_4Ti_5O_{12}$ 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 the 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 $Li_4Ti_5O_{12}$ (LTO) anode material has been prepared and characterized to evaluate its electrical properties.

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, EDS, XRD, Conductivity measurement, I-V characteristics and activation energy calculation for LTO was performed. To optimize performance of lithium ion batteries in terms of good cycle ability, capacity and power density during the electrochemical analysis of batteries. These characterizations showed that LTO has low conductivity and have high activation energy. Hence to improve the conductivity, C_2H_2 treatment was performed on LTO. Which showed improvement in its characteristics by lowering the activation energy and increasing the conductivity due to carbon deposition.