RESEARCH METHODOLOGY:-

1. By controlling parameters like dispensing rate of the solution and speed of spray head movement with the help of Robotic Spray pyrolysis equipment automatic check over the various fatigue and error creating possibilities would be established. A positive displacement pump controlled by stepper motor and microprocessor to dispense solution as per requirement. The spray head movement is also controlled by stepper motor driven linear stages in X and Y direction. The temperature of the substrate heater plate is controlled independently through a dedicated controller. This will in turn control the factors affecting bonding and subsequent build up of the coating (Cleanliness, Surface area, Surface topography or profile, Temperature (thermal energy), Time (reaction rates, cooling rates etc.), Velocity (kinetic energy), Physical & chemical properties, Physical & chemical reactions) by these methodology make spray pyrolysis methodology would become most suitable method for large area and multilayer thin films preparation with uniform thickness and crystalline properties by use of liquid solutions or powders.

2. Through designed set of experiments, the range of initial spray conditions such as precursor and solvent type, deposition temperature, precursor solution concentration, nozzle-to-substrate distance, carrier gas flow rate, and solution flow rate, over which the LSM film could be reproducibly deposited in the stoichiometric ratios on YSZ substrate would be determined. This will suffice the objective to obtain greater conversion efficiency for the Solid oxide fuel cells by use of thin films prepared by spray pyrolysis Method.

3. Use of Adhesion Test, Micro structural and Phase Characterization with Scanning Electron Microscope, Energy Dispersive X-Ray Spectroscopy, X-ray Diffraction, and Electrical Conductivity Measurement are some of the Technological tools used to substantiate and analyze the results to study the design parameters of the spray pyrolysis mechanism in order to create a generic analysis suitable for improvement of thin film quality produced by it.

4. Subsequent design and development of experimental procedures for developing the novel spray pyrolysis system and its implementation in processing of multi-layered thin films based on optimization of processing parameters would be initiated with the
use of nozzles of different materials and diameters. This will fulfill the objective of analyzing the impact of changing nozzle diameter and material with respect to changing physical parameters like temperature, pressure, volume, height of nozzle spray, Spray deposition time, type of substrate, one at a time to study the impact of quality of the thin film produced for improving the quality of the thin films produced

5. During each step, all these deposition parameters would be kept constant except for the parameter that is going to be investigated. The intension of the methodology is to prove that it has major or minor effects on morphology. Physical and chemical properties during spray pyrolysis would be analyzed. This will enable us study the parameters like surface morphology, Crystallinity, photoconductivity conductivity, Resistivity associated with the thin films produced on various types of substrates by the spray pyrolysis technique by use of various spray design variations and nozzle parameters for optimization of solar fuel cell conversion efficiency. Based on these results, critical parameters would be identified and optimized to provide conditions for processing improved quality multi-layered gradient porous thin films.