Fabrication of LSC Cathodes for Intermediate-Temperature SOFCs via Spray Pyrolysis

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The increasing global demand for energy and the depletion of fossil fuel resources have intensified the pursuit of alternative, efficient energy conversion technologies. Solid oxide fuel cells (SOFCs) are highly promising candidates, offering direct chemical-to-electrical energy conversion with efficiencies reaching 40–50%, which can be further enhanced through cogeneration systems. These attributes make SOFCs particularly advantageous for stationary power applications.

A significant challenge in advancing SOFC technology lies in the development of cathode materials that exhibit low electrochemical resistance, particularly at intermediate operating temperatures (500–700°C). Traditional fabrication methods such as sol-gel synthesis and magnetron sputtering have shown some success but still present limitations in achieving optimal cathode performance. Notably, LSC-based cathodes produced by magnetron sputtering have demonstrated promising results, particularly when compositions such as LSC113 and LSC214 are strategically combined.

This study explores the spray pyrolysis technique as an alternative approach for the fabrication of LSC cathodes. Spray pyrolysis offers distinct advantages, including better control over composition, morphology, and scalability compared to conventional techniques. In this work, LSC cathodes were synthesized using spray pyrolysis, and their structural and electrochemical characteristics are being systematically evaluated. Emphasis is placed on assessing the morphological features and the electrochemical performance, specifically the area-specific resistance at intermediate temperatures.

Preliminary findings will be benchmarked against LSC cathodes fabricated by other methods, such as magnetron sputtering, to critically assess the potential of spray pyrolysis as a viable, cost-effective route for high-performance IT-SOFC cathodes. The outcomes of this study are expected to contribute to the advancement of scalable and efficient cathode production strategies for intermediate-temperature SOFC applications.

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References

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