

An Account on Functionalization of Materials: Influence on the Performance Evaluation of Solid State Devices [†]

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Abstract: The power sector is one of the major constituents of a country's infrastructure. In this context, solid-state devices based on fuel cells have gained significant interest owing to their variable fuel usage, better performance evaluation, and tailored long-term endurance. In such an aspect, the primary role is employed by the materials viz. electrode and electrolyte irrespective of the operating temperature.

An account will be provided by the speaker on the correlation among tailoring the properties of the electrode through functionalization during synthesis and performance evaluation of the solid-state devices. Research work on functional anode materials applicable to high temperature fuel cells will be discussed. Functionalization of Ni-yttria stabilized zirconia composite through particulate deposition technique enables the formation of unique Ni@SZ microstructure, thereby resulting in a high current density of 3.7 A.cm⁻² at 800°C for coupon cell (ϕ16-32 mm) with high endurance for 2000 hrs. Penetration depth analysis of such cermet has been carried out successfully as a function of Ni content. The effectivity of such anodes will also be discussed with multiple fuels. For low-temperature applications, polymer-based electrolytes are employed. Functional poly (ethylene oxide) based electrolyte with optimized compositions are reported to significantly enhance the performance with even better long term tenability.

Keywords: fuel cell; functional material; core-shell; polymer electrolyte; performance evaluation.

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Conflicts of Interest

The authors declare no conflict of interest.