On the origin of the enhanced activity of the anode in solid oxide fuel cell by the effect of nanostructured doping of CeO2-based oxide (Ceria)

M. Reda
CanadElectrochim,
Calgary Alberta Canada

Intermediate-temperature solid oxide fuel cells (IT-SOFCs) have attracted worldwide attention because lowering the operating temperature (from 1000 ◦C to 500–800 ◦C) has potential to considerably widen the selection of less expensive materials to reduce cost while improving the reliability and operational life of SOFC systems. It is well known, however, SOFC performance drops rapidly as operating temperature is reduced due to the increased resistances of electrolyte and electrodes. Mixed ionic and electronic conducting oxide such as ceria is usually doped in the formulation of the anode catalyst in order to operate the SOFC at intermediate temperature. It is shown here that the origin of the effect of doped ceria is due to its ability to produce a quick and stable hierarchical structure that is necessary for the formation of stable superhydrophobic film of the Cassie-Baxter type. Thus the effect of Ceria is its ability to mimic nature and produce a stable hierarchical structure similar to that present in lotus leaf.

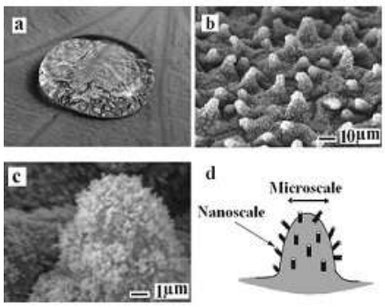

Figure 3: a: Superhydrophobic lotus leaf. b: Enlarged SEM photo of the lotus leave. c: Higher magnification of the lotus leaf showing the micro-sized papillae. d: The micro-sized papillae that contain many nanosized branch like protrusion (Wikipedia Encyclopedia).