Solid acid fuel cell electrodes: Is precious metal free catalysis the next breakthrough?

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Solid acid fuel cells (SAFCs) represent a new and highly attractive technology in the field of electrochemical energy conversion. Their state of the art electrolyte, CsH_2PO_4 (CDP), a solid acid compound with a superprotonic phase transition to a high proton conductivity phase at around 240˚C allows intermediate fuel cell operating temperatures. Compared to other intermediate temperature fuel cells, such as alkaline and phosphoric acid, a solid electrolyte permits a much more robust and simple design. It has been shown that the electrochemical reactions at the electrodes give rise to the largest overpotential and hence an improvement of the electrodes will significantly enhance the competitiveness of SAFCs. In this talk, I will discuss how nanoparticles of CDP may be obtained via the cheap, scalable, and technologically relevant process of spraydrying and electrostatic atomization and surface functionalized carbon nanotubes may be employed as the electrocatalyst. In addition to their electrochemical performance, I will focus on their long term stability both at a theoretical and a practical level.