**Stability of Nickel in Ni/Zirconia Electrodes at High Steam Concentrations**

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In this presentation, the effect of high fuel utilization on the stability of the nickel/yttria-stabilized zirconia (YSZ) anodes is discussed. Anode-supported button cell tests were performed in synthetic reformate with variable humidity levels corresponding to 45-90% fuel utilizations at 700-900oC for up to 3,500 hours. Control cells operating on reformate with low humidity were also present in each test. While no electrochemical or microstructural anode degradation was observed during tests with humidity corresponding to 50-70% fuel utilization, the anode degradation was slightly accelerated at higher levels of humidity corresponding to 85-90% fuel utilization. To eliminate the possible contributions of cathode and seal degradations, Ni/YSZ anodes were exposed to high humidity levels at 800, 900 and 1000oC for 1000-5000 hours in a controlled gas-tight environment as coupons. Microstructure analysis was performed using scanning electron microscopy by collecting a set of 10 nickel elemental maps per condition. Image JTM software was used to determine the size of Ni particles and standard deviation. While no changes in the Ni particle size was observed in all tests conducted with 3% steam, the changes in the Ni particle size became statistically significant after exposures to 52-53% steam for 3000 hours at 900oC. Coarsening of nickel crystallites in the active anodes occurred much faster at high temperatures.