Study of Fuel Cell Poisoning

Beamline: X13B

Technique: Powder Microdiffraction

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Motivation: Given the complex compounds present in fuel cells, it has been suggested that one mechanism of fuel cell poisoning is that new alloys form in-situ during operation at the interfaces between the functional components of the fuel cell. In order to observe this, a series of powder patterns were obtained with a ~1.5-micron-sized beam, while simultaneously obtaining the fluorescence to determine if any new phases were formed at the interfaces. The fluorescence signal allowed us to determine precisely the interface location and the diffraction identifies the chemical phases that are present.

Results:
No unknown compounds were observed at the interfaces of the cathode and electrolyte to the ~1.5micron spatial resolution.

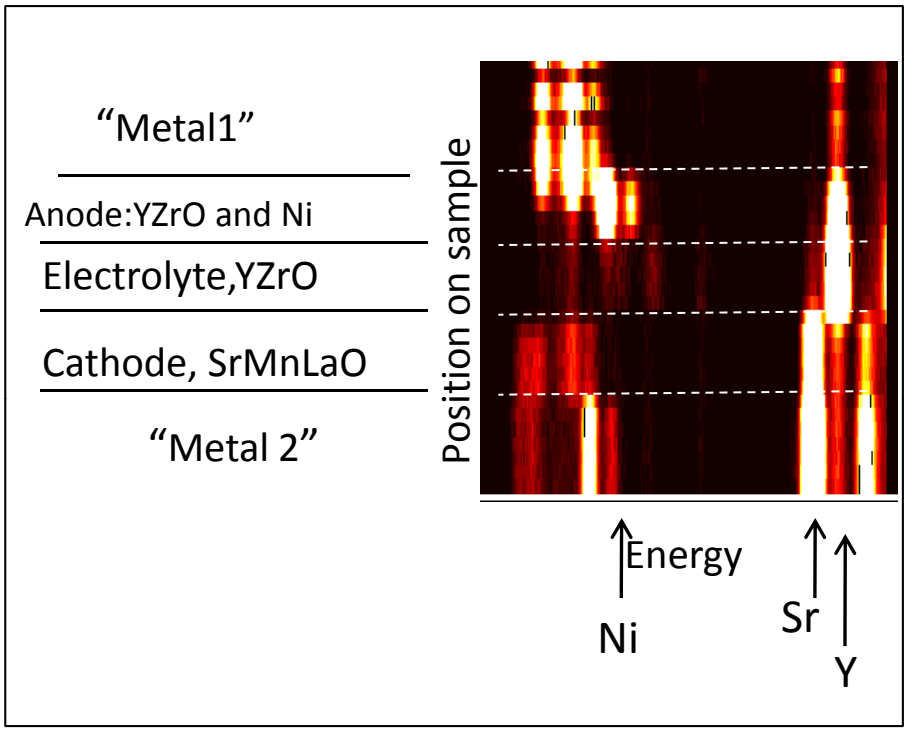

Figure: X axes is the energy of the emitted fluorescence, and the Y axis is the position of the beam. Markers show the spatial location of the different functional layers, the cathode, electrolyte and anode. The fluorescence energies for Ni, Sr, and Y which help us identify the layers are indicated.