Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Structural Dynamics and Activity of Nanocatalysts Inside Fuel Cells by in-operando Atomic Pair Distribution Studies. BINAY PRASAI, Central Michigan University — We present the results from a study aimed at clarifying the relationship between the atomic structure and activity of nanocatalysts for chemical reactions driving fuel cells, such as the oxygen reduction reaction (ORR). Using in-operando high-energy X-ray diffraction we tracked the evolution of the atomic structure and activity of noble metal-transition metal(NM-TM) nanocatalysts for ORR as they function at the cathode of a fully operational proton exchange membrane fuel cell (PEMFC). Data were analyzed in terms of atomic pair distribution functions and compared to the current output of the PEMFC, which was also recorded during the experiments. The comparison revealed that under actual operating conditions, NM-TM nanocatalysts can undergo structural changes that differ significantly in both length-scale and dynamics and so can suffer losses in their ORR activity that differ significantly in both character and magnitude. Therefore, we argue that strategies for reducing ORR activity losses should implement steps for achieving control not only over the length but also over the time-scale of the structural changes of NM-TM NPs that indeed occur during PEMFC operation.

Binay Prasai
Central Michigan University

Date submitted: 15 Nov 2016 Electronic form version 1.4