Contribution ID: **643** Type: **Oral (Non-Student) / orale (non-étudiant)**

# You don't know what you've got 'till it's gone: ambient surface degradation of ZnO powders

*Tuesday, June 16, 2015 9:15 AM (15 minutes)*

ZnO has rich electronic and optical properties that are influenced by surface structure and composition, which in turn are strongly affected by interactions with water and carbon dioxide. We correlated the effects of particle size, surface area, and crystal habit with data from X-ray photoelectron spectroscopy and zeta potential measurements to compare the degradation of ZnO powders prepared by several different synthesis methods. Neither surface polarity nor surface area, on their own, can account for the differences in the extent of carbonation among differently synthesized ZnO samples, and dissolution is a very significant in some samples [1]. Furthermore, ambient surface carbonation appears to be self-limiting for some ZnO powders (solvothermal synthesis), while ZnO produced by other synthesis methods (solid-state metathesis) can be completely converted to hydrozincite, $Zn_5(OH)_6(CO_3)_2$ in a matter of weeks. We show how these differences in surface carbonation correlate with frequency-dependent electrical properties, emphasizing the impact of ambient humidity variations.

[1] J. Cheng and K.M. Poduska, ECS Journal of Solid State Science and Technology, 3 (5) P133-P137 (2014).

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**Session Classification:** T1-9 Nanostructured Surfaces and Thin Films (DSS-DCMMP) / Surfaces et couches minces nanostructurées (DSS-DPMCM)

**Track Classification:** Surface Science / Science des surfaces (DSS)