XIAODONG ZHU

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EDUCATION

Yale University, New Haven, CT, *US;* **M.S., Ph.D. Candidate** in Chemical Engineering *Sep. 2011 - May. 2017 (exp)*
- **Advisor**: *Prof. E. I. Altman* **Focus:** *Thin film deposition and characterization, surface chemistry*

Nankai University, Tianjin, *China*; **B.S.** in Chemistry *Sep. 2007 - Jun. 2011*
- **GPA**: *3.8/4* **Focus:** *Metal organic frameworks* (*MOFs*), *drug delivery polymers*

RESEARCH EXPERIENCE & PROFESSIONAL SKILLS

Yale University, Department of Chemical & Environmental Engineering **New Haven, CT, *US***
Major Thesis Projects *Sep.2012 - Present*
- Conducted molecular beam epitaxy (MBE) growth of Cr_2O_3 thin films on ferroelectric $LiNbO_3$ and polar ZnO substrates in order to study whether a non-polar catalytic film's surface would be tailored by a polar substrate
- Used TEM, XRD and XPS to characterize the growth, geometric and electronic structures of Cr_2O_3 layers; proposed the disorder to order interfacial transition through the film evolution
- Statistically analyzed the ultra-violet spectroscopy (UPS) valence band spectra while observing an enhanced density of states near the valence band edge for Cr_2O_3 on ZnO (0001)
- Constructed ZnO/Cr_2O_3/ZnO sandwiches to identify the critical thickness of the Cr_2O_3 intermediate layer that can pass through the ZnO polarization information from the bottom to the top
- Performed alcohols (e.g., 1-propanol) temperature programmed desorption (TPD) and chemical wet etching to study the surface reactivity of the Cr_2O_3 and ZnO films on multiple substrates systems

Experimental skills
- Hand on experiences with UHV equipment, troubleshoot *>10* critical instrument issues, constructed one MBE chamber (2x e-beam evaporators, QCM, Plasma Generator, etc) from scratch semi-independently
- Practical expertise on precise deposition of sub monolayer to few hundred nanometer thick metal (Pd, Ru) and metal oxide films (e.g., Cr_2O_3, ZnO, IrO_2, RuO_2, O_2 or O plasma assisted) with effusion cells and/or e-beam evaporators monitored by reflection high energy electron diffraction (RHEED)
- Good knowledge with operating in-situ XPS/UPS, CMA/hemisphere analyzers and low energy electron diffraction (LEED) optics to interpret the chemical nature and surface crystallography of the grown films

Software skills
- Familiar with *C/C++* and *Matlab*, integrated a C script in Origin to implement a general least square fitting of two random discrete functions for complex UPS and TPD spectra interpretation
- Experienced with *Solidworks* designing and testing, independently designed several chamber parts (e.g., X-ray gun translation stage) which all works at the first implementation without further alternations

SELECTED PUBLICATIONS, CONFERENCES & CERTIFICATES

- **X. Zhu,** C. Zhou, Z. Chen, et al., "Controlling the polarity of the ZnO films grown on a ZnO (0001) substrates with altering Cr_2O_3 as an intermediate layers thicknesses", *to be submitted*
- **X. Zhu**, M. D. Morales-Acosta, J. Shen, et al., "Growth, structure, and electronic properties of nonpolar thin films on a polar substrate: Cr_2O_3 on ZnO (0001) and ZnO (000-1)", *Physical Review B*, 92, 165414 (2015)
- M. Herdich, **X. Zhu**, M. D. Morales-Acosta, et al., "The modification of ferroelectric $LiNbO_3$ (0001) surfaces using chromium oxide thin films", *Physical Chemistry Chemical Physics*, 17, 9488 (2015)

- *Poster & Discussion Leader* - **X. Zhu,** paired with Dr. Karl-Heinz Ernst, Special Topics Session, *Gordon Research Seminar: Chemical Reactions at Surfaces*, Ventura, CA (2015)
- *Oral Talk* - **X. Zhu**, M. D. Morales-Acosta, J. Shen, et al., "Characterizations of nonpolar polar interfaces: Cr_2O_3 on ZnO (0001) and (000-1) ", *AVS 62nd symposium*, San Jose, CA (2015)
- *Oral Talk* - **X. Zhu**, E. I. Altman, "The growth of catalytic thin films on a polar substrate: Cr_2O_3 on ZnO (0001) and ZnO (000-1) ", *AVS 61st symposium*, Baltimore, MD (2014)

- ***AVS** Certificates* - Atomic Layer Deposition: Basic Principles, Characterizations, and Applications (2015)
- ***AVS** Certificates* - Photolithography Process in IC Production (2015)

LANGUAGES & OTHER RELATED EXPERIENCES

Language: Fluent in *Mandarin*; Working Proficiency in *English* **TOEFL**: *107*
Teaching Fellow: Applied Numerical Methods, Professional Ethics, Chemical Reaction Engineering, Chemical Engineering Process Design, etc.