CASE WESTERN RESERVE UNIVERSITY
CASE SCHOOL OF ENGINEERING

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RESEARCH AREAS AND APPLICATIONS

- Ceramics for electronic, chemical, and biomedical applications
- Synthesis of ceramic thin films
- Thin-film gas sensors
- Composites for EMI shielding
- Ceramic fuel cell materials
- Apatite coatings for biomedical implants

APPROACHES

- Ceramic thin films from aqueous media
- "Substrate engineering" — self-assembled organic monolayers
- Microstructural analysis: XPS, SEM, XRD, TEM, AFM

COLLABORATIONS

- Sensor Development Corp. — N. Smilanich
- Sherwin-Williams Corp. — P. Kayima, M. Croyle
- Max-Planck-Institut, Stuttgart, Germany — F. Aldinger
- Bar-Ilan University, Ramat-Gan, Israel — Prof. C. Sukenik
- Electronics Design Center, CWRU — C. C. Liu
- CWRU Dental School — R. Wang
- CWRU EECS — M. Tabib-Azar
- Center for Cardiovascular Biomaterials, CWRU — R. Marchant

RESEARCH SPONSORS

- NSF GOALI
- NSF SBIR
- TRW Foundation
- CWRU PRI

RECENT ACCOMPLISHMENTS

- Using the atomic force microscope (AFM), found evidence of a charge reversal (Stern) layer in aqueous solutions adjacent to amine-functionalized surfaces. This may account for the previously unexplained ability to deposit both positively charged (e.g. TiO_2) and negatively charged (e.g. V_2O_5) films on amine self-assembled monolayers (SAMs) (see right). (Support: NSF GOALI)
- Fabricated ferrite-glass composites for electromagnetic interference shielding applications, and characterized their performance up to 20 GHz. (Support: TRW)
- Establishing spin-coating parameters to optimize performance of thin-film tin oxide gas sensors. (Support: NSF SBIR)

Substrate Engineering with Self-Assembled Monolayers

	$-SO_3H$ SAM (Š charged)	***amine*** SAM (Stern layer)	$-N(CH_3)_3^+$ SAM (+ charged)
TiO_2	***film***	***film***	***no film***
V_2O_5	***no film***	***film***	***film***