

THE 6TH ANNUAL
JAMES O. STOFFER
LECTURE IN
CHEMISTRY

2 p.m. Friday, Oct. 8, 2021
Schrenk Hall, Room G3

Electrodeposition of Transparent and Flexible Electronics

Dr. Jay Switzer, Chancellor's Professor at Missouri S&T
and Curators' Distinguished Professor Emeritus

MISSOURI
S&T | Chemistry

“ELECTRODEPOSITION OF TRANSPARENT AND FLEXIBLE ELECTRONICS”

By Dr. Jay Switzer

Abstract: Single-crystal silicon is the bedrock of semiconductor devices due to the high crystalline perfection that minimizes electron-hole recombination, and the dense SiO_x native oxide that minimizes surface states. One issue with the material is that it's both brittle and opaque. There is interest in moving beyond the planar structure of conventional Si-based chips to produce flexible and transparent electronic devices such as wearable solar cells, sensors and flexible displays. In this talk, we will discuss the electrodeposition of transparent, wide bandgap semiconductors such as ZnO, CuI and CuSCN that can be produced as epitaxial films on single-crystal substrates. These epitaxial films have an orientation that is controlled by the substrate, with electronic properties that mimic those of single crystals. We also show that the epitaxial films can be removed by a simple lift-off procedure to produce single-crystal-like flexible foils of transparent semiconductors.

DR. JAY SWITZER

Dr. Jay Switzer is Chancellor's Professor at Missouri S&T and University of Missouri Curators' Distinguished Professor Emeritus. He is also a senior investigator at the Materials Research Center. Switzer received his bachelor's degree in chemistry from the University of Cincinnati and his Ph.D. in inorganic chemistry from Wayne State University under professor John F. Endicott.

After receiving his Ph.D., he joined Union Oil Company of California (UNOCAL) as a senior research chemistry. His research at UNOCAL was on photoelectrochemistry and the electrochemical processing of photovoltaic cells. In 1986, Switzer joined the materials science and engineering department at the University of Pittsburgh as an associate professor. In 1990, he moved to Missouri S&T as a professor of chemistry. He became Curators' Distinguished Professor in 1994, and Donald L. Castleman Professor of Chemistry in 1999.

In 2020, he assumed his present position as Chancellor's Professor. Switzer has spent most of his adult life working on the electrodeposition of nanostructured metal oxide semiconductors, magnetic materials and catalysts. He is best known for his work on the electrodeposition of epitaxial metal oxides, oxide superlattices, chiral surfaces, and freestanding single-crystal-like foils.

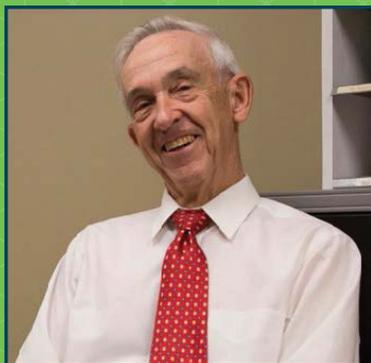
Switzer was elected a Fellow of the American Association for the Advancement of Science (2013), Materials Research Society (2015), Electrochemical Society (2018), and Japan Society for the Promotion of Science (2017).

His awards include the 2003 Electrodeposition Research Award of The Electrochemical Society, the 2006 American Chemical Society Midwest Award, and the 2007 President's Award for Research and Creativity by the University of Missouri System. He served as an editor for the *Journal of Materials Research* and *Chemistry of Materials*. In addition to his research, Switzer has served his profession by relentlessly promoting electrochemistry to the scientific community.



DR. JAMES O. STOFFER

James Stoffer is Curators' Distinguished Professor Emeritus of Chemistry and past director of the Graduate Center for Materials Research. He taught many courses in the chemistry department including Freshman Chemistry, Organic Chemistry and Polymer Chemistry. Additionally his experience includes teaching paint short courses in Rolla for over 30 years, as well as at the National Paint Show and at the American Chemical Society meeting each year. He has advised over 50 graduate students and research with these students includes the first papers on microemulsion polymerization processes, one of the first papers on polymerization of liquid crystals, the first papers on ultrasonic dispersion of pigments for paints, on ultrasonically initiated and microwave initiated free radical catalyzed polymerizations, and on transparent composites. Most of his research deals with the preparations and properties of coatings and polymers. He has sought to develop a replacement for chromium as the corrosion inhibitor for aluminum of aircraft since 1992, in collaboration with Dr. Tom O'Keefe and his group. Dr. Stoffer published over 150 publications and authored 12 patents, one of which provides royalties to fund this lecture.



ABOUT THE DR. JAMES O. STOFFER LECTURE SERIES

The purpose of this lecture series is to invite highly respected and qualified professionals to Missouri S&T to discuss topics relevant to chemistry, especially polymer chemistry. Speakers shall address the faculty and students of the department, as well as the university community and the public. The topics chosen vary in order to cover a full spectrum of the fields of interest relevant to the department. Preference is given to speakers from the chemistry department, alumni and/or those specializing in polymer chemistry, and be chosen in a collegial manner by a means normal to the operation of the department. Annually, the lecture series provides an opportunity for an alumnus or another outstanding individual to speak to students and the campus community about the impact and importance of education on their career.

PREVIOUS DR. JAMES O. STOFFER LECTURERS:

2016 — Dr. Janet Lynn Kavandi

2017 — Dr. Eric Peterson

2018 — Dr. William James

2019 — Dr. Delbert Day

2020 — Dr. M. Stanley
Whittingham*

** Deferred to 2021 due to pandemic*



ABOUT THE DEPARTMENT OF CHEMISTRY

Founded as the department of chemistry and metallurgy in 1871, one short year after Missouri School of Mines and Metallurgy was established, it was later to become the department of chemistry and chemical engineering — and finally to become the department of chemistry in 1968.

Academic staff includes 18 regular, full-time faculty, 2 Chancellor's Professors, 10 emeritus faculty members, and 10 adjunct faculty and comprise one of the highest external research grant-generating departments at Missouri S&T.

Whether it's replacing the chromium in aircraft coatings, using algae as an alternative energy source or treating lead poisoning, at Missouri S&T's department of chemistry, it's all about interdisciplinary research that will have a positive impact on the world.

The department offers a bachelor of arts with emphasis in secondary education and a bachelor of science which is certified by the American Chemical Society and places strong emphasis on the integration of research into undergraduate education. The graduate programs include a master of science (with or without thesis), a master of science for teachers, and the doctor of philosophy degree with research in all areas of chemistry.

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