



University of Zagreb
Faculty of Textile Technology (TTF) and AMCA TTF

invite you to a

SCIENTIFIC LECTURE

entitled

**„Protective Nanocoatings from Polyelectrolytes: Flame Retardancy,
Super Gas Barrier, and Heat Shielding“**

by

Dr. Jaime C. Grunlan

on Monday, 20th March 2023 at 12:00
lecture hall A - 301, Prilaz baruna Filipovića 28a, Zagreb

Abstract:

Layer-by-layer (LbL) assembly is a conformal coating “platform” technology capable of imparting a multiplicity of functionalities on nearly any type of surface in a relatively environmentally friendly way. At its core, LbL is a solution deposition technique in which layers of cationic and anionic materials (e.g. nanoparticles, polymers and even biological molecules) are built up via electrostatic attractions in an alternating fashion, while controlling process variables such as pH, coating time, and concentration. Here we are producing nanocomposite multilayers (50 – 1000 nm thick), having 10 – 96 wt% clay, that can be completely transparent, stop gas permeation, and impart extreme heat shielding to polymeric substrates. In an effort to impart flame retardant behavior to fabric using fewer processing steps, a water-soluble polyelectrolyte complex (PEC) was developed. This nanocoating is comprised of polyethylenimine and poly(sodium phosphate) and imparts self-extinguishing behavior to cotton fabric in just a single coating step. Adding a melamine solution to the coating procedure as a second step renders nylon-cotton blends self-extinguishing. More recently, a PEC coating was developed for polyester-cotton. It passes vertical flame testing after five standard washes or 8 hours in boiling water. Either of these two coating techniques can be deposited using flexographic printing or spray-coating tools. Opportunities and challenges will be discussed. Our work in these areas has been highlighted in C&EN, ScienceNews, Nature, Smithsonian Magazine, Chemistry World and various scientific news outlets worldwide. For more information, please visit my website: <http://nanocomposites.tamu.edu>

Biography:



Dr. Jaime Grunlan is the Leland T. Jordan '29 Chair of Mechanical Engineering at Texas A&M University, where he has worked for more than 18 years. He holds joint appointments in the Department of Materials Science and Engineering and the Department of Chemistry. His research focuses on thermal and transport properties of polymer nanocomposites. He is a world leader in organic thermoelectric materials, super gas barrier layers, and environmentally-benign, flame retardant nanocoatings. He holds 14 issued U.S. patents and several EU patents that have been licensed to more than 10 companies. He has published more than 200 journal papers, with more than 23,000 citations. Dr. Grunlan has graduated 27 PhD students and has mentored more than 50 undergraduate students in his research laboratory. His work has been highlighted in Smithsonian Magazine and the New York Times. He is an Editor of the Journal of Materials Science, Associate Editor of Green Materials, and serves on the International Advisory Board for Macromolecular Rapid Communications and Macromolecular Materials and Engineering. In 2018, Prof. Grunlan became a Fellow of the American Society of Mechanical Engineers (ASME) and was awarded a doctorate honoris causa (i.e. honorary doctorate) from the University of South Brittany (Lorient, France). In 2019, he became a Senior Member of the National Academy of Inventors (NAI).