

Fall 2021 Department of Chemical and Biological Engineering Seminar Series
H. M. Comer 1026
11:00-11:50AM

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Surface and Interfacial Studies on Thermal Barrier and Hydrophobic Coatings on Paper Substrates

Abstract: Multifunctional coatings provide intelligent modifications to base substrates, and find applications in a wide range of areas, such as aerospace, building, packaging and cosmetics. This presentation will focus on summarizing several efforts of the Prager research group in innovative material development of coatings onto porous substrates, with likely applications in the food or sensitive goods packaging industries. Interfacial properties between the coating and its substrate are exploited to determine their influence on bulk coating performance such as superhydrophobicity and thermal barrier properties, and are being investigated both experimentally and via computational modelling. The unique properties of cellulose nanocrystals (CNC) and cellulose nanofibers (CNF) are being exploited by incorporating them into 'routine' paperboard-coatings to enhance thermal barrier development within the coating. Meanwhile, supercritical impregnation of alkyl ketene dimers and other food-grade waxes into porous substrates are the techniques used for superhydrophobic development of paper substrates. Bond development between the waxes and cellulose are assessed via FTIR, as well as the resulting strength properties of the modified paper. These changes are also being compared with surface development of superhydrophobicity via contact angle measurements and SEM imaging. Ultimately, these individual coatings will be combined as one multifunctional coating.

Bio: Dr. Prager has had a diverse career since graduating with a PhD in Chemical Engineering in 1999, holding both industry and academic positions. She is the owner of a patent as a result of work conducted at Kodak Australia Research Laboratory. She also led a large process development effort of a new point-of-care sensor whilst at Universal Biosensors Incorporated, Australia, which involved developing a full-scale manufacturing process from pilot-scale trials. In academia, Dr. Prager has an extensive paper-coating background after spending five years as Research Fellow at the Australian Pulp and Paper Institute, Monash University, Australia, coupled with her current work on multifunctional coatings at the University of Mississippi, USA. During this time, she took a brief break from Chemical Engineering and retrained as a high school teacher where she was a classroom teacher and head of Science at Victorian Department of Education Schools. This experience, together with her educational research background, has formed her current interests in exploring differentiated teaching and learning at University-level, thereby extending the common differentiation principles from K-12 classrooms.