MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

Thursday, September 4 2025, at 13:30-14:00, D. Dan and Betty Kahn Building, Room 217

Characterizing the stability of poly-ethylene glycol surface coatings as a function of environmental conditions

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Poly-ethylene glycol (PEG) is widely utilized as an antifouling coating in biomedical applications, such as cell micropatterning, due to its protein-resistant properties. However, PEG's anti-fouling efficacy can degrade over time, presenting significant challenges for long-term cell culture and optimizing storage protocols. This seminar presents a systematic characterization of the degradation of methoxy PEG succinimidyl valerate (mPEG-SVA) coatings on glass surfaces as a function of temperature and humidity over a a ten week period.

Using a fluorescence-based quantification method, we demonstrate that storage in a phosphate-buffered saline (PBS) is more protective against degradation than reducing the storage temperature. . Our findings reveal that PEG coatings stored dry at room temperature (25°C) exhibit the highest loss of antifouling function, while storage in PBS at both 4°C and 25°C, or dry storage at −20°C, effectively preserve coating integrity over 10 weeks.

Additionally, we generated micropatterns of PEG by selectively degrading the PEG using maskless photolithography. We visualized the micropatterned with, fluorescence microscopy and used atomic force microscopy (AFM) to probe the nanoscale topographical changes in the PEG coating as a result of degradation. These complementary techniques provide insight into both the chemical and physical aspects of PEG degradation.

The results of this study establish practical guidelines for optimal shipping and storage conditions of PEG-coated substrates and inform best practices for experimental micropatterning workflows. This work contributes to the optimization of surface patterning strategies in mechanobiology and tissue engineering research, where maintaining coating stability is critical for experimental reproducibility and long-term functionality.

Note: the seminar will be given in English