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### **Antithetical Polymers: Performance Through Structured Incompatible Elements**

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Modern coating technology is often limited by a complex trade space that leaves many applications poorly served. Next generation coatings able to successfully meet these application challenges typically require multiple and often contradictory properties not easily met with traditional homogenous compositions. This presentation describes our efforts to combine highly incompatible coating elements capable of organizing into discrete regions at mesoscopic length scales (0.1-10  $\mu\text{m}$ ) in order to express multiple undiluted physical properties of individual components at the macroscopic scale. Such a strategy requires understanding and controlling the interactions between composition and processing that ultimately drive microstructure and performance. Specific examples presented will include anti-fouling coatings where we have combined a low surface energy component with a lubricating region or anti-freeze element to mitigate accumulation of insect debris or delay freezing, respectively.

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