MOLECULARLY ENGINEERED ORGANIC PARTICULATE FILMS: PREPARATION, STRUCTURE AND PERFORMANCE

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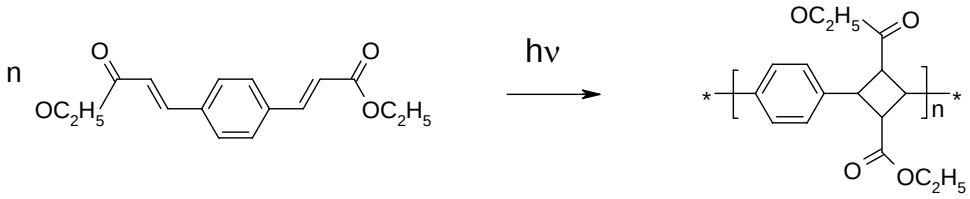
Diethyl *p*-phenylenediacrylate (EPA) particles with tunable molecular adsorption characteristics were produced by a novel molecular imprinting procedure applied during the solid-state photo-polymerization reaction. EPA monomer is micronized by Rapid Expansion of Supercritical Solutions (RESS) and deposited directly on Surface Acoustic Wave (SAW) resonators. The templated photo-polymerization of EPA monomer particles was performed on the SAW devices. During the UV initiated solid-state polymerization EPA forms a linear polymer[1,2].



The molecular sieving capability of EPA polymer particles is demonstrated by monitoring the SAW resonance frequency during the sorption of alkane analytes of different sizes. The mass changes due to vapor uptake resulting from the selective sorption into the particulate coatings can be measured accurately due to the nanogram sensitivity of the piezoelectric crystal. Although the molecular porosity was created using template molecules from a different chemical family, these coatings exhibited reversible sorption properties when tested against alkane analytes[3]. A gradual exclusion of smaller analyte molecules from the molecularly imprinted particulate coatings is observed as the size of the template molecule is reduced as shown in Figure 1.

The focus of this presentation will be on the identification of the mechanisms controlling the self-organization and morphological transformations observed during the photopolymerization reaction in the presence of specific template vapors. The structure-property relationship as well as applications of these unique coatings will be discussed.

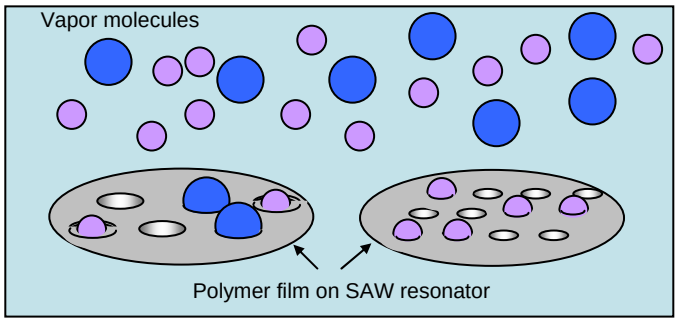


Figure 1. Schematic representation of the exclusion of analyte molecules observed in the molecularly imprinted particulate coatings as a function of template molecule size.

References

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2. M. Hasegawa. "Four-center Photopolymerization in the Crystalline State" *Advances in Polymer Science*, **42**, 1-49, 1982.

3. Guney-Altay, O., Pestov, D., Tepper, G., “Organic Zeolites from a Diolefinic Monomer”, *Journal of the American Chemical Society*, **129**, 13957-13962, 2007.