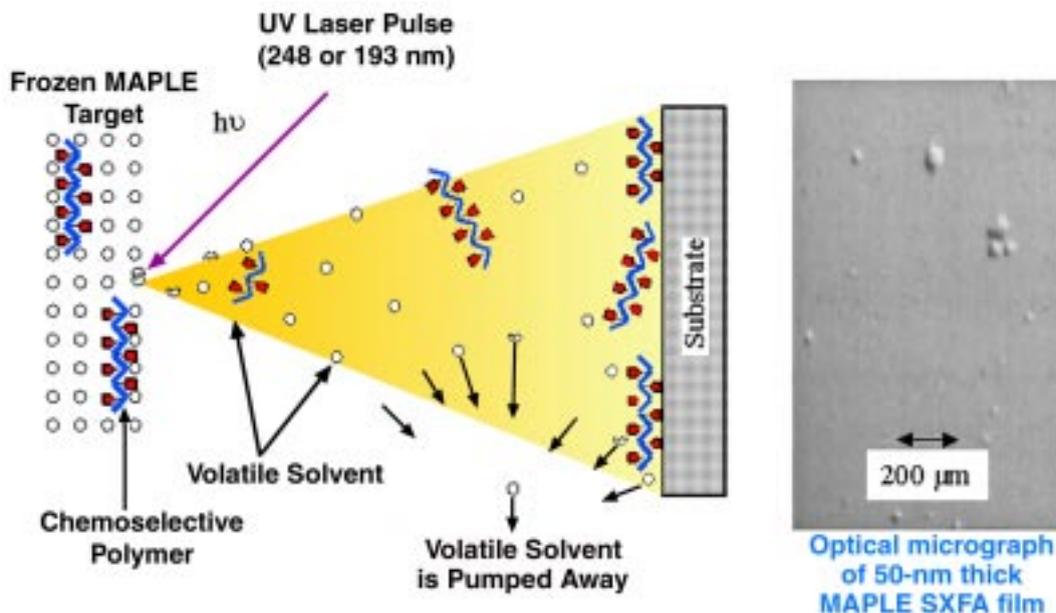


LASER DEPOSITION OF THIN POLYMER FILMS



The Naval Research Laboratory has developed a novel method for producing polymer, large organic molecule or biomolecule thin films. The process, known as Matrix Assisted Pulsed Laser Evaporation (MAPLE), utilizes a low-fluence pulsed UV laser and a frozen target consisting of a dilute mixture of the material to be deposited and a high vapor-pressure solvent. The low-fluence laser pulse interacts mainly with the volatile solvent, causing it to evaporate. In the process, the solute desorbs intact, i.e., without any significant decomposition, and is then uniformly deposited on the substrate. Advantages of the MAPLE process over existing deposition techniques include:

- Allows deposition of compounds, such as biomolecules or polymers, that cannot withstand the temperatures or solvents used to deposit films by other techniques.
- Deposited films are extremely smooth and uniform over large areas.
- Can use masks to prepare patterned films with feature sizes as small as $\sim 10 \mu\text{m} \times 10 \mu\text{m}$.
- Solvent is removed by pumping leading to a dry process, unlike spin-coating.
- Multilayered films can be deposited without risk of dissolving the underlying layer with solvent.

MAPLE has been used to fabricate chemoselective polymer films for application in surface acoustic wave (SAW) sensors for detecting chemical warfare agents and unexploded ordinance, and in sensors developed for condition-based maintenance. The optical micrograph shown above illustrates the smooth surface morphology obtained with MAPLE for the chemoselective fluoroalcohol polysiloxane polymer, SXFA.

Points of Contact

Naval Research Laboratory
4555 Overlook Avenue, SW • Washington, DC 20375

Jane F. Kuhl • Head, Technology Transfer Office (202) 767-3083 • kuhl@utopia.nrl.navy.mil
Douglas B. Chrisey, Ph.D. • Head, Plasma Processing Section (202) 767-4788