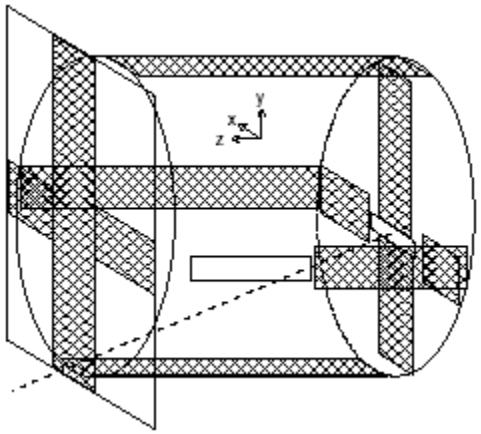
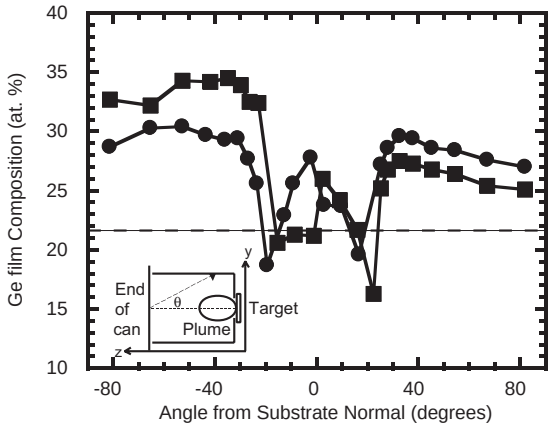
Film Growth Mechanisms in Pulsed Laser Deposition

Michael J. Aziz, Harvard University, DMR-9727369

Pulsed Laser Deposition is a promising thin film fabrication technique for the formation and integration of advanced materials. One of its principal advantages is that under some circumstances the chemical composition of the material grown is very nearly identical with the composition of the starting material, thereby permitting precise control of the composition of grown material. Under some circumstances, which are poorly understood, the composition of the grown material is considerably different. An experiment found out where the missing elements go. When the masses of ablated atoms are very different, the lighter atoms get preferentially "backscattered" back toward their point of origin due to the complex dynamics of the laser ablation process, and fewer of them reach the growing film. *Applied. Physics A* ***69****, 23 (1999).*





Experiment to find the missing atoms.

Left: Laser (dotted line) hits target (at right end of can) and ablates off atoms atoms that move toward left end of can in a "plume". Some of the lighter atoms end up scattered away in the plume and hit the detection strips (cross-hatched).

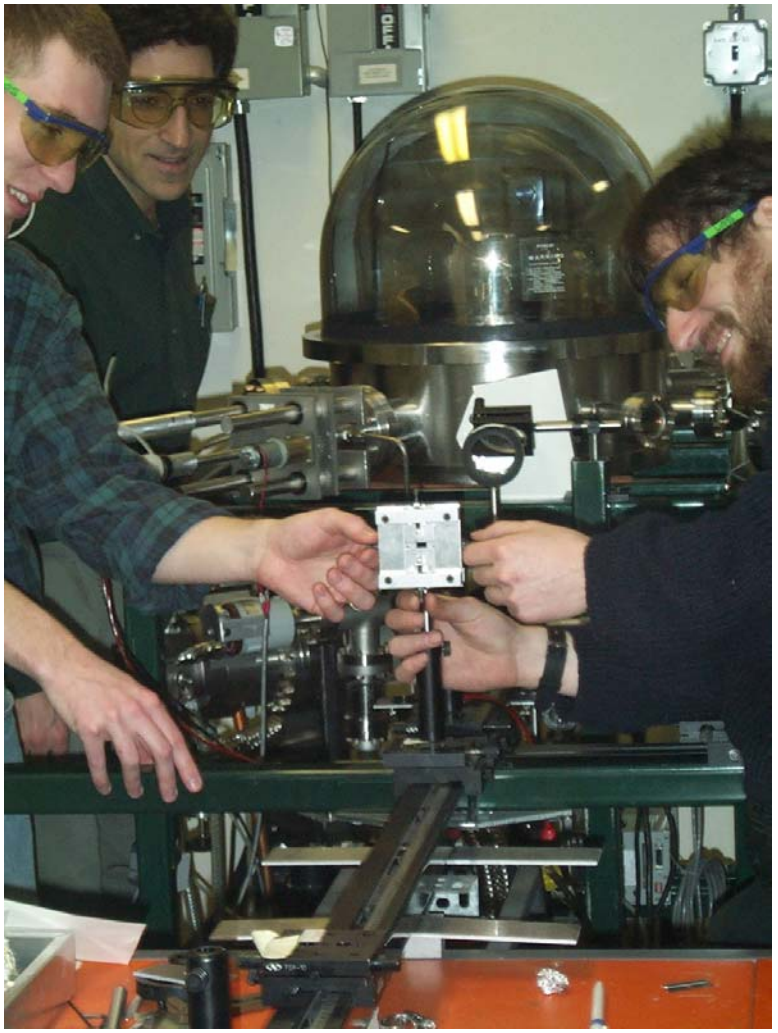
Right: Composition of ablated atoms sticking to detection strip at various locations of can. Different shaped data points are for different targets which nevertheless show similar behavior. Composition varies from above to below bulk target composition as position of detection is varied.

Film Growth Mechanisms in Pulsed Laser Deposition

Michael J. Aziz, Harvard University, DMR-9727369

Education:

Supported the Ph.D. training of Dr. Yucong Huang (now in U.S. financial sector), Dr. Craig Arnold (now on the Princeton faculty and training another generation of engineers), and Jeffrey Warrender (still a student); and the postdoctoral training of Jorge Kittl (a minority U.S. citizen, now at Texas Instruments), Paul Sanders (now at Ford Motor Company), and John Leonard (now on the faculty at the University of Pittsburgh and training another generation of materials scientists).



Training tomorrow's teachers

The Principal Investigator is shown supervising the tuning of the laser beam path by graduate students Jeff Warrender (left) and Craig Arnold (right).