Mechanical Engineering

GRADUATE SEMINAR

Functionally Grading the Shape Memory Response: Melt-Mediated Thin Film Laser Crystallization

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Shape memory based devices have recently experienced renewed interest, particularly at the micro scale. This is due in part to the significantly enhanced surface area to volume ratio for thin film structures, eliminating the limitations to dynamic response caused by long heat dissipation times for sensing/actuation applications. This research has led to the development of a process whereby monolithic thin film structures can be fabricated to produce films exhibiting a spatially varied shape memory response. Specifically a pulsed, melt-mediated laser crystallization process is employed to simultaneously modify both the microstructure and stress state of NiTi films. The capacity to manipulate these parameters is shown to effectively modify aspects of the response including the martensitic phase transformation temperature and strain recovery due to the superelastic and/or shape memory effects. Thermodynamic properties of laser processed films are characterized via temperature dependent optical microscopy and X-ray diffraction, while the resulting mechanical and shape memory responses are characterized via a coupled atomic force microscopy/nanoindentation technique.

Dr. Birnbaum received his bachelors and masters degrees from Carnegie Mellon University. He recently went on to receive his doctorate at Columbia under the supervision of Prof. Y. Lawrence Yao, and has accepted a postdoctoral position at the Naval Research Lab.

Thursday, Feb 19, 2009
11:00 am Seminar in 233 Mudd