

## **Vapor Deposited Polyimide Shells with Improved Surface Smoothness\***

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The surface of polyimide (PI) shells, prepared by co-depositing stoichiometrically fluxes of a dianhydride and a diamine onto a mechanically agitated mandrel, has been rough. The roughness has been attributed to the various sources, including defects and contamination of substrate mandrels and abraded damages due to mechanical agitation and non-stoichiometry in composition.

We have demonstrated the surface roughness is mostly due to the impact damage from mechanical agitation. Great improvement in surface quality has been achieved in 1- $\mu$ m size polyimide shells by utilizing a plastic wire-mesh type pan with a proper opening, which limits the movements, reduces impact force and prevents contacts between the shells during tapping agitation. The wire-mesh pan, while not completely eliminating all defects, greatly improves the surface quality of fluorinated polyimide coatings as well. Appropriate pressure and heat profiles are used to remove the mandrel, to convert the polyamic acid into polyimide and preserve the surface smoothness. The surface quality of the 4-5 $\mu$ m thick shells is near the NIF standard.

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