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***Stress engineering for free-standing SU-8 2002 thin film devices***

In this paper we describe a process for creating thin SU-8 2002 films between 1.5  $\mu\text{m}$  and 3.0  $\mu\text{m}$  thick that are hard-baked and can withstand a release etch in either aqueous or plasma silicon etchants. Resulting films are characterized using both wafer bow and membrane bulge tests to monitor in-plane stress and Young's modulus. We explore the influence on final film stress of several process variables including hard bake temperature, exposure dose, film thickness, and various temperature profiles. We observe resultant film stress in the range of 13.8 to 32 MPa, and Young's modulus in the range of 2.1 to 5.2 GPa for free-standing membranes. Illustrative process recipes are described for both patterned and un-patterned SU-8 2002 membrane devices.