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Optimization of wafer-back pressure profile in chemical mechanical planarization[1] TIAN-SHIANG YANG, YAO-CHEN WANG, IAN HU, National Cheng Kung University — In chemical mechanical planarization (CMP), a rotating wafer is pressed facedown against a rotating pad, while a slurry is dragged into the pad–wafer interface to assist in planarizing the wafer surface. Due to stress concentration, the interfacial contact stress near the wafer edge generally is much higher than that near the wafer center, resulting in spatially nonuniform material removal rate and hence imperfect planarity of the wafer surface. Here, integrating theories of fluid film lubrication and two-dimensional contact mechanics, we calculate the interfacial contact stress and slurry pressure distributions. In particular, the possibility of using a multizone wafer-back pressure profile to improve the contact stress uniformity is examined, by studying a practical case. The numerical results indicate that using a two-zone wafer-back pressure profile with optimized zonal sizes and pressures can increase the "usable" wafer surface area by as much as 12%. Using an optimized three- zone wafer-back pressure profile, however, does not much further increase the usable wafer surface area.

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