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Exploration of Thermal Impacts in Bulk Oxide Chemical Mechanical Polishing

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Abstract

Chemical mechanical polishing (CMP) is a vital process in semiconductor manufacturing for achieving surface planarity and smoothness. Thermal effects during bulk oxide CMP play a significant role in process performance, influencing material removal rates, surface quality, and overall efficiency. This article explores the thermal impacts in bulk oxide CMP, delving into their underlying mechanisms, effects on process parameters, and mitigation strategies. Elevated temperatures during CMP can lead to oxide layer softening, accelerated chemical reactions, and increased pad wear, affecting process stability and uniformity. Understanding the influence of process parameters such as downforce, slurry composition, and polishing speed on thermal effects is crucial for optimizing CMP processes. Mitigation strategies including optimized process parameters, cooling mechanisms, and pad conditioning are essential for minimizing thermal impacts and maintaining consistent process performance. By addressing thermal effects in bulk oxide CMP, semiconductor manufacturers can enhance process control, improve wafer yields, and ensure the reliability of integrated circuits.

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