Development of Ozonated Water Wafer Cleaning System

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We have studied optimization of ozonated water wafer cleaning system as an alternative to sulfuric peroxide mixture (SPM) cleaning of semiconductor wafers. This process uses ozone and vaporized DI water, significantly reducing cost-of-ownership and any effect on environment, health and safety. Photoresist removal rate is enhanced by increasing the dissolved O_3 concentration. Reaction rate of aqueous O_3 with photoresist is increased, but aqueous O_3 concentration is reduced by increasing the process temperature. Therefore, optimization of process temperature is required to maximize the photoresist removal rate. In addition, photoresist removal rate is strongly affected by boundary layer thickness of stagnant O_3 solution at the photoresist surface. Influences of substrate temperature, ozone concentration and eight types of reactor model on the removal rate have been experimentally investigated using three different types of photoresist (I-line, ArF and KrF). FT-IR was used to analyze the substrate before/after the treatment in order to clarify the mechanism of the resist stripping by ozone and DI water vapor.