Chemically Controlled Megasonic Cleaning Technology for Higher PRE and Lower Pattern Damage

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Abstract

Megasonic cleaning has been know as the most effective way to clean the semiconductor wafers and masks. Controlling of transient cavitation is necessary to meet the stringent requirements of achieving high PRE and low pattern damage. Addition of a suitable surfactant would play a key role in achieving the controlled cavitation by means of the surfactant adsorption on acoustic bubble interfaces effectively. In this work, the effect of commercial surfactant cleaning solution (SELECTIPUR C-2106) concentration on PRE and pattern damage was evaluated. It was observed that higher PRE can be achieved at lower concentrations and it becomes negligible at higher concentrations. However, pattern damage was reduced gradually with increase of surfactant concentration. It was observed that change of zeta potential or static surface tension are not the key factors in affecting the PRE values. From the results, it is understood that the dynamic surface tension of the surfactant would be the critical factor in controlling the transient cavitation and translating it into stable cavitation to influence both PRE and pattern damage. It is hypothesized that dynamic surface tension of the surfactant affects the cavitation bubble size differently with increase of concentration and as a result influences the PRE and pattern damages differently. It was found that bubble size increases at lower concentration and it decreases to a greater extent at higher concentration by producing different microstreaming to affect PRE and pattern damage differently. From these results it can be concluded that suitable concentration of surfactant should be used to achieve better cleaning performance.

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