

ABSTRACT

METHODS AND APPARATUS FOR CLEANING SEMICONDUCTOR WAFERS

A method for cleaning semiconductor substrate without damaging patterned structure on the substrate using ultra/mega sonic device comprising applying liquid into a space between a substrate and an ultra/mega sonic device; setting an ultra/mega sonic power supply at frequency f_1 and power P_1 to drive said ultra/mega sonic device; before bubble cavitation in said liquid damaging patterned structure on the substrate, setting said ultra/mega sonic power supply at frequency f_2 and power P_2 to drive said ultra/mega sonic device; after temperature inside bubble cooling down to a set temperature, setting said ultra/mega sonic power supply at frequency f_1 and power P_1 again; repeating above steps till the substrate being cleaned.

Normally, if $f_1 = f_2$, then P_2 is equal to zero or much less than P_1 ; if $P_1 = P_2$, then f_2 is higher than f_1 ; if the $f_1 < f_2$, then, P_2 can be either equal or less than P_1 .

FIG 1A