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(54) Title: SMOOTH SILICON-CONTAINING FILMS

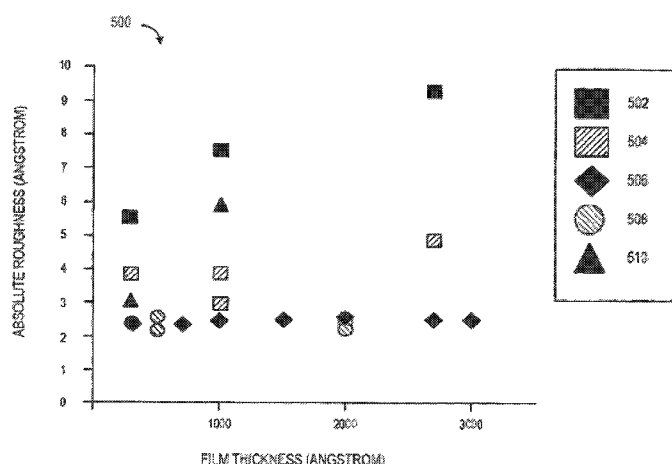


FIG. 5

(57) Abstract: Methods and hardware for depositing ultra-smooth silicon-containing films and film stacks are described. In one example, an embodiment of a method for forming a silicon-containing film on a substrate in a plasma-enhanced chemical vapor deposition apparatus is disclosed, the method including supplying a silicon-containing reactant to the plasma-enhanced chemical vapor deposition apparatus; supplying a co-reactant to the plasma-enhanced chemical vapor deposition apparatus; supplying a capacitively-coupled plasma to a process station of the plasma-enhanced chemical vapor deposition apparatus, the plasma including silicon radicals generated from the silicon-containing reactant and co-reactant radicals generated from the co-reactant; and depositing the silicon-containing film on the substrate, the silicon-containing film having a refractive index of between 1.4 and 2.1, the silicon-containing film further having an absolute roughness of less than or equal to 4.5 as measured on a silicon substrate.



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