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(54) **ATOMIC LAYER DEPOSITION METHODS**

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(52) **U.S. Cl.** ..... **438/493**; 438/503; 438/507; 117/102

(58) **Field of Search** ..... 438/492, 493, 438/503, 507, 680, 761, 762; 117/89, 93, 102; 427/255.26

(57) **ABSTRACT**

An atomic layer deposition method includes positioning a semiconductor substrate within an atomic layer deposition chamber. A first precursor gas is flowed to the substrate within the atomic layer deposition chamber effective to form a first monolayer on the substrate. The first precursor gas flowing comprises a plurality of first precursor gas pulses. The plurality of first precursor gas pulses comprises at least one total period of time between two immediately adjacent first precursor gas pulses when no gas is fed to the chamber. After forming the first monolayer on the substrate, a second precursor gas different in composition from the first is flowed to the substrate within the deposition chamber effective to form a second monolayer on the first monolayer. Other aspects and implementations are contemplated.

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