W/m^2 or more, and expose the reaction chamber to the second plasma for a duration of about 0.5 seconds or more per plasma exposure.

22. A method of forming titanium dioxide encapsulation layers over memory stacks on a semiconductor substrate, comprising:

(a) receiving the substrate having a plurality of magnetoresistive random access memory (MRAM) stacks or phase change random access memory (PCRAM) stacks thereon in a reaction chamber;

(b) depositing a first encapsulation layer comprising titanium dioxide on the plurality of MRAM stacks or PCRAM stacks using a first plasma-assisted atomic layer deposition reaction;

(c) after (b), depositing a second encapsulation layer comprising titanium dioxide on the first encapsulation layer using a second plasma-assisted atomic layer deposition reaction, wherein the second plasma-assisted atomic layer deposition reaction is performed under different plasma conditions than the first plasma-assisted atomic layer deposition reaction.

23. A method of depositing a titanium dioxide encapsulation layer over memory stacks on a semiconductor substrate, comprising:

(a) receiving a substrate having a plurality of magnetoresistive random access memory (MRAM) stacks or phase change random access memory (PCRAM) stacks thereon in a reaction chamber;

(b) flowing a titanium-containing reactant into the reaction chamber and allowing the titanium-containing reactant to adsorb onto the surface of the substrate;

(c) flowing an oxygen-containing reactant into the reaction chamber and allowing the oxygen-containing reactant to adsorb onto the surface of the substrate;

(d) exposing the reaction chamber to plasma for a duration of about 0.5 seconds or less to drive a surface reaction between the titanium-containing reactant and the oxygen-containing reactant to thereby conformally deposit an encapsulation layer over the plurality of MRAM stacks or PCRAM stacks, wherein the encapsulation layer comprises titanium dioxide, and wherein the plasma is generated using an RF power density of about 1750 W/m^2 or less;