WHAT IS CLAIMED IS:

1. A slurry composition for chemical mechanical polishing (CMP) of a phase-change memory device in the absence of abrasive particles, comprising deionized water and iron or an iron compound, wherein the slurry composition does not include abrasive particles.

2. The slurry composition according to claim 1, wherein the phase-change memory device comprises a metal alloy or a chalcogenide.

3. The slurry composition according to claim 2, wherein the phase-change memory device comprises at least one compound selected from InSe, Sb_2Te_3, GeTe, $Ge_2Sb_2Te_5$, InSbTe, GaSeTe, $SnSb_2Te_4$, InSbGe, AgInSbTe, (GeSn)SbTe, GeSb(SeTe) or $Te_{81}Ge_{15}Sb_2S_2$.

4. The slurry composition according to claim 1, wherein the iron or iron compound comprises metal iron or a compound containing iron in its molecular structure.

5. The slurry composition according to claim 1, wherein the iron or iron compound comprises an ionic iron compound or an iron chelate compound.

6. The slurry composition according to claim 1, wherein the iron or iron compound is present in an amount of about 0.01 to about 10% by weight, based on the total weight of the slurry composition.

7. The slurry composition according to claim 1, wherein the slurry composition has a pH of about 2 to about 10.

8. The slurry composition according to claim 1, further comprising a pH-adjusting agent.

9. The slurry composition according to claim 8, wherein the pH-adjusting agent comprises at least one acid selected from nitric acid, phosphoric acid, sulfuric acid, hydrochloric acid, organic carboxylic acids having a pKa of 6 or less, or a combination thereof.

10. A method for polishing a phase-change memory device comprising a phase change layer, wherein the method comprises contacting said phase-change material layer in the absence of abrasive particles with a CMP slurry composition comprising deionized water and iron or an iron compound.

11. The method according to claim 10, wherein the phase-change memory device is fabricated by applying an insulating material to a semiconductor wafer to form an insulating layer, planarizing the insulating layer, patterning the planar insulating layer, and applying a phase-change material to the patterned insulating layer to form a phase-change material layer; and the CMP slurry composition is brought into contact with the phase-change material layer to polish the phase-change material layer until the insulating layer is exposed.

12. The method according to claim 11, wherein the phase-change material layer is polished by applying the CMP slurry composition to a rotating polishing pad and bringing the polishing pad into contact with the phase-change material layer under predetermined pressure conditions to polish portions of the phase-change material layer by a frictional force.

13. A phase-change memory device polished by the method according to claim 10.

What is claimed is:

1. A method for polishing a phase-change memory device comprising a phase change layer, wherein the method comprises contacting said phase-change material layer in the absence of abrasive particles with a CMP slurry composition comprising deionized water and iron or an iron compound, wherein the iron or iron compound is present in an amount of about 0.01 to about 10% by weight, based on the total weight of the slurry composition.

2. The method according to claim 1, wherein the phase-change memory device is fabricated by applying an insulating material to a semiconductor wafer to form an insulating layer, planarizing the insulating layer, patterning the planar insulating layer, and applying a phase-change material to the patterned insulating layer to form a phase-change material layer; and the CMP slurry composition is brought into contact with the phase-change material layer to polish the phase-change material layer until the insulating layer is exposed.

3. The method according to claim 2, wherein the phase-change material layer is polished by applying the CMP slurry composition to a rotating polishing pad and bringing the polishing pad into contact with the phase-change material layer under predetermined pressure conditions to polish portions of the phase-change material layer by a frictional force.

4. The method according to claim 1, wherein the phase-change memory device comprises a metal alloy or a chalcogenide.

5. The method according to claim 4, wherein the phase-change memory device comprises at least one compound selected from InSe, Sb_2Te_3, GeTe, $Ge_2Sb_2Te_5$, InSbTe, GaSeTe, $SnSb_2Te_4$, InSbGe, AgInSbTe, (GeSn)SbTe, GeSb(SeTe) or $Te_{81}Ge_{15}Sb_2S_2$.

6. The method according to claim 1, wherein the iron or iron compound comprises metal iron or a compound containing iron in its molecular structure.

7. The method according to claim 1, wherein the iron or iron compound comprises an ionic iron compound or an iron chelate compound.

8. The method according to claim 1, wherein the slurry composition has a pH of about 2 to about 10.

9. The method according to claim 1, further comprising a pH-adjusting agent.

10. The method according to claim.9, wherein the pH-adjusting agent comprises at least one acid selected from nitric acid, phosphoric acid, sulfuric acid, hydrochloric acid, organic carboxylic acids having a pKa of 6 or less, or a combination thereof.

11. The method according to claim 1, wherein the iron or iron compound is an iron chelate compound.

12. The method according to claim 1, wherein the iron or iron compound comprises propylenediamine tetraacetic.

13. The method according to claim 1, wherein the iron or iron compound comprises $FeCl_3$.

14. The method according to claim 1, wherein the iron or iron compound is a GST oxidizing agent.