

POLISHING COMPOSITIONS AND METHODS FOR POLISHING COBALT FILMS

ABSTRACT

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The present disclosure relates to polishing compositions that can polish Cobalt (Co) films in semiconductor substrates containing a multitude of films including Co, metals, metal oxides and dielectrics. These polishing compositions comprise an abrasive, a weak acid acting as a removal rate enhancer (RRE), a pH adjuster, and an azole-containing corrosion inhibitor (CI). The RRE, pH adjuster and CI have a pKa in the 1-18 range ($1 (\text{pKa}_{\min}) < \text{pKa} < 18 (\text{pKa}_{\max})$). The pKa values of the individual components are related to the pH of the polishing composition/slurry ($\text{pH}_{\text{slurry}}$) by the following equation: $\text{pKa}_{\min} + 6 < \text{pH}_{\text{slurry}} < \text{pKa}_{\max} - 6$. The polishing composition also has less than about 100 parts per million (ppm) of sulfate ions and less than about 100 ppm of halide ions, and operates in the 7-12 pH range.

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[Fig. 5]