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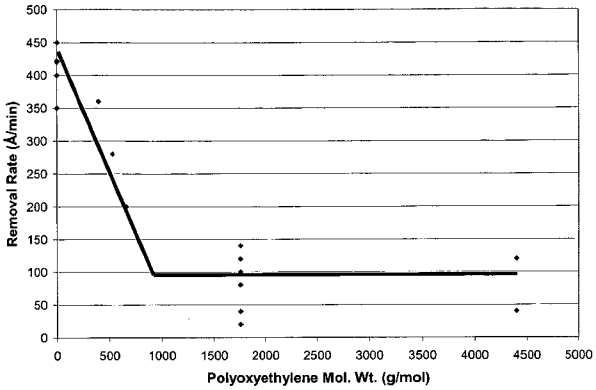
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(54) Title: METHODS AND COMPOSITIONS FOR POLISHING SILICON-CONTAINING SUBSTRATES

FIG. 4



(57) Abstract: The invention provides chemical-mechanical polishing (CMP) compositions and methods for polishing a silicon-containing substrate. A method of the invention comprises the steps of contacting a silicon-containing substrate with a polishing pad and an aqueous CMP composition, and causing relative motion between the polishing pad and the substrate while maintaining a portion of the CMP composition in contact with the surface of the substrate to abrade at least a portion of the substrate. The CMP composition comprises a ceria abrasive, a polishing additive bearing a functional group with a pK_a of 4 to 9, a nonionic surfactant with an hydrophilic portion and a lipophilic portion wherein the hydrophilic portion has a number average molecular weight of 500 g/mol or higher, and an aqueous carrier, wherein the pH of the composition is 7 or less. The method reduces defects on the wafers, particularly local areas of high removal. The method is also useful for polishing dielectric silicon-containing substrates at a high rate relative to semiconductor silicon-containing substrates.

WO 2010/014180 A3

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