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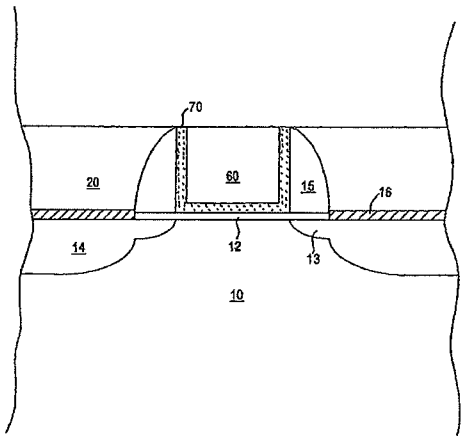
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(54) Title: REPLACEMENT METAL GATE TRANSISTORS WITH REDUCED GATE OXIDE LEAKAGE



(57) Abstract: Thin effective gate oxide thickness with reduced leakage for replacement metal gate transistors is achieved by forming a protective layer (70) between the gate oxide layer (12) and metal gate electrode (60), thereby reducing stress. Embodiments include forming a protective layer of amorphous carbon (70) containing metal carbides decreasing in concentration from the metal gate electrode (60) toward the gate oxide layer (12) across the protective layer. Embodiments of methodology include removing the removable gate, depositing a layer of amorphous carbon on the gate oxide layer, forming the metal gate electrode (60) and then heating at an elevated temperature to diffuse metal from the metal gate electrode into the amorphous carbon layer (70), thereby forming the metal carbides. Embodiments also include metal gate transistors with a gate oxide layer (82) having a high dielectric constant and silicon concentrated at the interfaces with the metal gate electrode (100) and substrate (10).

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