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(54) Title: IMPROVED GATE ELECTRODE CONNECTION STRUCTURE BY IN SITU CHEMICAL VAPOR DEPOSITION OF TUNGSTEN AND TUNGSTEN NITRIDE

(57) Abstract

A gate electrode connection structure formed by deposition of a tungsten nitride barrier layer (8) and a tungsten plug (9), where the tungsten nitride and tungsten deposition are accomplished in situ in the same chemical vapor deposition (CVD) chamber. The tungsten nitride deposition is performed by plasma enhanced chemical vapor deposition (PECVD) using a plasma containing hydrogen, nitrogen and tungsten hexafluoride. Before deposition the wafer is pretreated with a hydrogen plasma to improve adhesion. The tungsten deposition process may be done by CVD using tungsten hexafluoride and hydrogen. A tungsten nucleation step is included in which a process gas including a tungsten hexafluoride, diborane and hydrogen are flowed into a deposition zone of a substrate processing chamber. Following the nucleation step, the diborane is shut off while the pressure level and other process parameters are maintained at conditions suitable for bulk deposition of tungsten.

