METHOD FOR IMPROVING BARRIER LAYER ADHESION TO HDP-FSG THIN FILMS

ABSTRACT OF THE DISCLOSURE

A method of formation of a damascene FSG film with good adhesion to silicon nitride in an HDP-CVD system. Silane (SiH_4), silicon tetrafluoride (SiF_4), oxygen (O_2) and argon (Ar) are used as the reactant gases. SiH_4, SiF_4, and O_2 react to form the FSG. Ar is introduced to promote gas dissociation. All four gases are used for depositing most of the FSG film. SiH_4 is not used during deposition of the interfacial part of the FSG film. The interfacial part of the FSG film refers either to the topmost portion, if silicon nitride is to be deposited on top of the FSG or the bottom portion if the FSG is to be deposited on top of silicon nitride. Using SiH_4 with the SiF_4 tends to mitigate the destructive effects of SiF_4 throughout most of the deposition. By removing the SiH_4 from the deposition of the interfacial part of the FSG film less hydrogen is incorporated into the film in the interfacial region and adhesion to overlying or underlying silicon nitride is improved.

Fig. 1