

ABSTRACT OF THE DISCLOSURE

VERY LOW DIELECTRIC CONSTANT PLASMA-ENHANCED CVD FILMS

The present invention provides a method for depositing nano-porous low dielectric constant films by reacting an oxidizable silicon containing compound or mixture comprising an oxidizable silicon component and an oxidizable non-silicon component having thermally labile groups with nitrous oxide, oxygen, ozone, or other source of reactive oxygen in gas-phase plasma-enhanced reaction. The deposited silicon oxide based film is annealed to form dispersed microscopic voids that remain in a nano-porous silicon oxide based film having a low-density structure. The nano-porous silicon oxide based films are useful for forming layers between metal lines with or without liner or cap layers. The nano-porous silicon oxide based films may also be used as an intermetal dielectric layer for fabricating dual damascene structures. Preferred nano-porous silicon oxide based films are produced by reaction of methylsilyl-1,4-dioxinyl ether or methylsiloxanyl furan and 2,4,6-trisilaoxane or cyclo-1,3,5,7-tetrasilylene-2,6-dioxy-4,8 dimethylene with nitrous oxide or oxygen followed by a cure/anneal that includes a gradual increase in temperature.

Fig. 2