High Density Plasma Etching of Hard Mask Materials of SiO_2, α–C:H, and ZnO

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Due to the degradation of photoresists before the considerable depth and wide of etching of the substrate in the etch process, the photoresist cannot be used for a high aspect ratio etching process. Therefore, hard mask was widely used as an etch mask because of the high plasma resistant to achieve a considerable aspect ratio. This work contains the comparison of SiO_2, α–C:H, and ZnO as hard mask materials for high density plasma etching of silicon in CF_4/Ar discharges. The mask erosion and etch profile were affected by the processing parameters such as ICP source power, rf chuck power, operating pressure, and etch gas concentration. ZnO is the best, which fulfills the requirement of stable hard mask materials for CF_4/Ar inductively coupled plasmas employed for silicon etching. While, α–C:H and SiO_2 were eroded exposure to CF_4/Ar inductively coupled plasmas.