

Bulk production of cyclo organopentasilane for deposition of Silicon thin films

The amorphous silicon and crystalline silicon thin films are used for electronic applications such as LED, solar panels, TFT, sensors, display devices etc. Conventional processes use organometallic precursors such as Si, SiC, GaAs, GaP, AlN, CdSe, CdHgTe, CuGaInSe to prepare electronic thin films. The present research is related to non-pyrophoric and non-corrosive precursors cyclic organopentasilane precursors used in bulk quantity for electronic applications and the process for preparing the same. These processes require highly sophisticated instrumentation facility like CVD, laser ablation etc. Out of these the Si thin films have attracted most of the users due to their longer life and comparatively easy availability of raw materials. For such applications SiH_4 and SiCl_4 are most commonly used precursor materials. Due to pyrophoric nature of silanes, handling and processing of these materials required high degree of manipulation skills and highly sophisticated processing devices which restrict easy commercialization of the products and technology.

The hygroscopic and corrosive nature of SiCl_4 also restrict its applications and due to generation of HCl, the Si thin films could not be grown beyond the certain thickness thus further limiting its applications. So continuously attempts are going on to use oligomeric / polymeric Si materials for deposition of Si thin films. Recently pentasilane has shown very promising results as LED materials. But the synthetic processes of these materials are also very cumbersome though safer to handle.

Further, the CVD and other thermal techniques are being used for deposition of amorphous Si and crystalline silicon thin films, which are very costly and also precursors used in these techniques are highly toxic and pyrophoric in nature. Hence there is a global demand to develop simplest techniques for the deposition of Si thin films.

DMSRDE, Kanpur has successfully optimized the technology for "Bulk production of cycloorganopentasilane for deposition of Si thin films" more particularly to a non-pyrophoric and non-corrosive precursors cyclic organopentasilane precursors for deposition of silicon thin films in bulk quantity for electronic applications. The present invention also relates to the process for preparation of cycloorganopentasilane.