A COMPREHENSIVE REVIEW ON THIN FILM DEPOSITIONS ON PECVD REACTORS

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Abstract. *The deposition of thin films by Plasma Enhanced Chemical Vapor Deposition (PECVD) method is a critical process in the fabrication of MEMS or semiconductor devices. The current paper presents an comprehensive overview of PECVD process. After a short description of the PECVD reactors main layers and their application such as silicon oxide, TEOS, silicon nitride, silicon oxynitride, silicon carbide, amorphous silicon, diamond like carbon are presented. The influence of the process parameters such as: chamber pressure, substrate temperature, mass flow rate, RF Power and RF Power mode on deposition rate, film thickness uniformity, refractive index uniformity and film stress were analysed. The main challenge of thin films PECVD deposition for Microelectromechanical Systems (MEMS)and semiconductor devices is to optimize the deposition parameters for high deposition rate with low film stress which and if is possible at low deposition temperature.*

Keywords: PECVD, TEOS, silicon oxide, residual stree, thin film deposition
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1. Introduction

Microelectromechanical System (MEMS) technology evolved from silicon process fabrication and is involved in various applications that require miniaturisation, such as mechanical sensors, [1-3] optical microdevices, [4, 5] microactuators [6], chemical synthesis [7, 8] or even biomedical devices [9-12].]. Plasma-enhanced chemical vapour deposition (PECVD) is one of the techniques frequently used in MEMS manufacturing. A relevant number of reports reveal the structural, optical and electronic properties of the classical PECVD thin layers such as amorphous silicon, [13-15] doped amorphous/polysilicon, [16] silicon oxide, [17-19] or TEOS [20, 21], silicon nitride, [22-24], silicon carbide [25-27] or diamond like carbon [28, 29]

Besides their role as a "passivation layer", the thin film PECVD layers were also used as a structural layer for surface micromachined MEMS devices [14],] and as a masking layer for deep wet or dry etching (bulk micromachining) [14, 30, 31], electrodes [32, 33] structural layer in solar cells, [34, 35] or in applications related cell cultures. [23, 36-38]. The main challenge of the PECVD for MEMS and

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