Optical characteristics of a-Si: H layers deposited by PACVD at various temperatures

Submitted by Bouchta Sahraoui on Wed, 06/17/2015 - 16:27

Titre	Optical characteristics of a-Si: H layers deposited by PACVD at various temperatures
Type de publication	Article de revue
Auteur	Jaglarz, J. [1], Jurzecka-Szymacha, M. [2], Tkacz-Śmiech, K. [3], Sahraoui, Bouchta [4]
Pays	Pays-Bas
Editeur	Elsevier
Ville	Amsterdam
Type	Article scientifique dans une revue à comité de lecture
Année	2015
Langue	Anglais
Pagination	26–33
Volume	39
Titre de la revue	Optical Materials
ISSN	1873-1252
Mots-clés	Amorphous hydrogenated silicon [5], band gap [6], Depolarization phenomena [7], Optical indices [8], PACVD [9], Spectroscopic ellipsometry [10]

Résumé en anglais

Amorphous a-Si:H layers fabricated by plasma assisted chemical vapour deposition are studied. The layers were grown on monocrystalline silicon at various temperatures, ranging from the room temperature to 400 °C. Structure and chemical composition (hydrogen content) of the layers were characterized by use of fourier transform infrared spectroscopy (FTIR).

A main attention in the studies was focused on optical properties of the layers. The respective measurements were made by variable angle spectroscopic ellipsometry within 170–1900 nm spectral range, at room temperature and during post-annealing the sample up to 400 °C. The Kramers–Krönig optical model was matched to the ellipsometric angle spectra, Ψ(λ) and Δ(λ), and hence the layers' thicknesses and optical indices were calculated. The band gap of the studied materials was calculated from the Tauc expression for the extinction index near the band edge.

The results show that the layers deposited at 150 °C have similar properties. Their growth rate is higher than 0.1 nm/s and hydrogen content does not exceed 10 at.%. All they have relatively high refractive index within visible light range. The highest refractive index is for the layer deposited at 400 °C and reaches almost 4.0 at 460 nm. The band gap of all layers deposited at 150 °C and above exceeds 2 eV but is not higher than 2.4 eV. The band gap of the layers deposited below 150 °C is less than 2 eV.

Post-annealing of the layers for 40 min at 400 °C does not change their optical indices but clearly reduces the depolarization.

URL de la notice	http://okina.univ-angers.fr/publications/ua12580 [11]
DOI	10.1016/j.optmat.2014.10.057 [12]

Liens
[1] http://okina.univ-angers.fr/publications?f[author]=20784
[2] http://okina.univ-angers.fr/publications?f[author]=21948
[3] http://okina.univ-angers.fr/publications?f[author]=21949
[4] http://okina.univ-angers.fr/bouchta.sahraoui/publications
[5] http://okina.univ-angers.fr/publications?f[keyword]=18903
[6] http://okina.univ-angers.fr/publications?f[keyword]=5216
[7] http://okina.univ-angers.fr/publications?f[keyword]=18906
[8] http://okina.univ-angers.fr/publications?f[keyword]=18905
[9] http://okina.univ-angers.fr/publications?f[keyword]=18904
[10] http://okina.univ-angers.fr/publications?f[keyword]=7020
[11] http://okina.univ-angers.fr/publications/ua12580
[12] http://dx.doi.org/10.1016/j.optmat.2014.10.057