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Hydrophobicity of hydrogenated silicon films as a function of substrate temperature

M. de Pauli, C. F. da Silva, L. L. Ferreira, J. F. Fragalli, A. L. de Oliveira, R. A. S. Zanon and M. M. Lacerda*

Physics Department at Universidade do Estado de Santa Catarina, Joinville – Santa Catarina 89223-100, monica_lacerda@joinville.udesc.br
* Corresponding author.

Abstract – This work studies hydrogenated amorphous silicon films deposited by PECVD in a pure silane gas atmosphere to evaluate their hydrophobic character as a function of the substrate temperature kept during deposition procedure. Temperature of the substrates varied from room temperature up to 200°C and samples were analyzed by Scanning electron microscopy, Energy dispersive x-ray and by measuring the contact angle between a de-ionized water droplet and samples surface. Results show that a-Si:H coating improved substrates hydrophobic character, however a-Si:H on different substrate presents different hydrophobic behavior.

Hydrogenated amorphous silicon films have been deposited by PECVD in a pure silane gas atmosphere in order to evaluate their hydrophobic character as a function of the substrate temperature kept during deposition procedure. These films are widely used as a solar-cell material and in opto-electronic system due to their semiconductor characteristics with attractive photoconductivity properties. This work proposes to study their tribological behavior to evaluate their reliability when applied at nano- and micro-devices [1, 2]. a-Si:H Films were grown on 3 different substrates, optical glass, doped silicon and steel, at 750 V DC plasma with a deposition pressure of 0.34 Torr for one hour. Temperature of the substrates varied from room temperature up to 200°C and samples were analyzed by Scanning electron microscopy (SEM), Energy dispersive x-ray (EDX) and by measuring the contact angle between a de-ionized water droplet and samples surface. Results show that a-Si:H coating improves substrates hydrophobic character, however a-Si:H films on different substrate present different hydrophobic behavior, as can be seen at figure 1. Figure 2 shows the water droplet on samples surface and reveals that a-Si:H coating on silicon substrate is more hydrophobic than on glass or on steel substrates, which is associated to the coating/substrate interface energy and also with samples surface roughness.

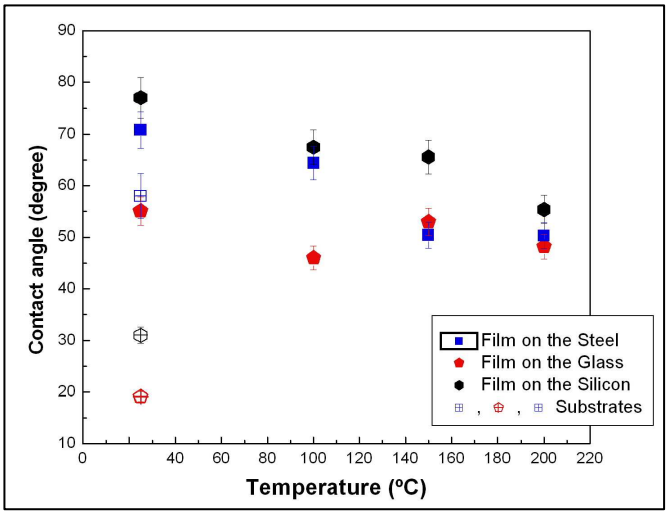

Figure 1: Contact angle as a function of the substrate temperature during deposition.

Figure 2: water droplet on samples surface.

References

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