ELLIPSOMETRY OF THIN PEPTIDE FILMS

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Spectroscopic ellipsometry is increasingly used for investigation of biofilms and biological materials because of its non-invasive manner. In the case of biofilms, the investigated material might be present on the surface only in small amounts forming an island-like coating. In this work, we used various types of peptides which adhesion differences in the case of deposition to n- and p-type silicon were determined in [1]. We investigate the applicability of different ellipsometric models for such peptide films. We also present which models lead to unphysical result and how it is possible to choose the correct ones utilizing only ellipsometric measurements.

Three different approaches were built to model our peptide films: i) a perfect layer which optical properties are modeled with Sellmeier-dispersion, ii) Sellmeier-dispersion extended with Gaussian absorption, iii) Sellmeier-dispersion assuming a non-continuous layer. Although the peptides are transparent in the visible spectral range as supported by absorption measurements, the first model failed. The second and the third approaches described the measured data with almost the same fitting quality, although their physical background is completely different. The second model applies a perfect layer with a slight absorption, and the third deals with a transparent layer which does not cover the substrate perfectly. To resolve this contradiction the results of a simulation will be presented that show the compatibility of the last two models, and explain why both models can describe the measured data. We will show that the absorption obtained in the second model can originate from the discontinuity of the layer. According to theory and simulations, the patterned character of the layer should lead to depolarization, which could ease the finding of the correct model [2].

However, in most cases depolarization is an undesired feature since it deteriorates degree of polarization, limiting the applicability of classical models. Therefore, through the examples of different sample types we emphasize the importance of handling depolarization in general [3,4].

Keywords: Peptide; Depolarization; Patterned layer ellipsometric model

References

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