Determination of the glass transition region of PVME by means of spectroscopic ellipsometry

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In this presentation, we report on the determination of the glass transition temperature of thin layers of Polyvinylmethylether (PVME) depending on the thickness of the polymer layer. The glass transition of thin polymer layers is currently under much investigation due to the nano-confinement effects proposed to appear in dependence on the layer thicknesses in the nm range. The properties of the polymer, the temperature range, as well as the thicknesses range of the polymer layers pose a serious challenge to the investigation by means of spectroscopic ellipsometry. By careful choice of experimental parameters, we were able to investigate the thickness change by temperature of PVME layers in the range between 2 and 300 nm and in the temperature range between 200 K and 340 K. By optimizing the analysis process, we were able to determine T_g values within this parameter range with sufficient accuracy to investigate the T_g change due to confinement effects.

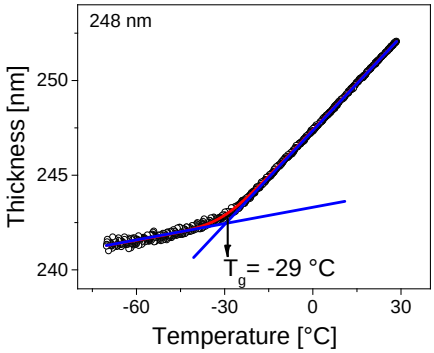

Fig. 1. T_g determination of a PVME layer

Alongside the change of position of the glass transition with thickness, we discuss the details of the ellipsometric analysis and its implications for the resulting thermal properties of the thin polymer layers [1] as well as the accuracy of the T_g value with respect to the method used in the analysis process.

Keywords: Polymers, PVME, temperature dependent ellipsometry, glass transition

References

[1] Madkour, S., et al., Decoupling of Dynamic and Thermal Glass Transition in Thin Films of a PVME/PS Blend. ACS Macro Letters, 2017. **6**(10): p. 1156-1161.