

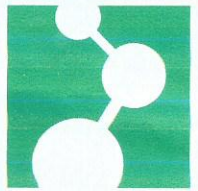


On Nonlinear Optical Properties of Polystyrene

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Introduction

Polystyrene has found known applications in integrated optics as passive waveguides [1], and also as active waveguides. Hu et.al. Demonstrated all-optical switching process in a polystyrene photonic crystal [2].

$$n = n_0 + n_2 I$$

$$\alpha = \alpha_0 + \alpha_2 I$$

Questions :

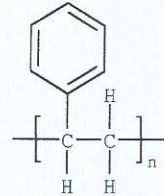
- What are the linear and cubic nonlinear properties relevant for all-optical switching?

Task: Measure α_2 and n_2 at 532 nm

Polystyrene

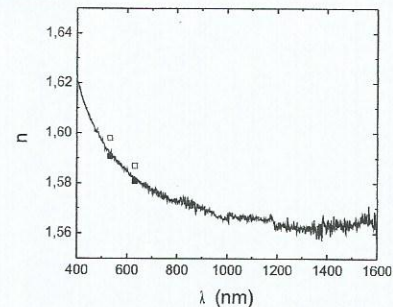
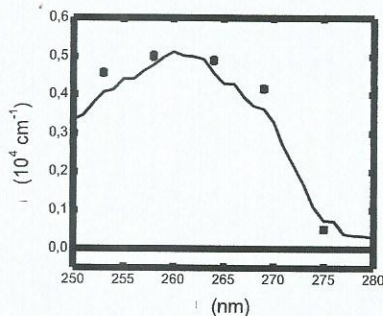
Polystyrenes are commercially available

Polystyrene or PS
 $M_w = 1,300,900$ g/mol



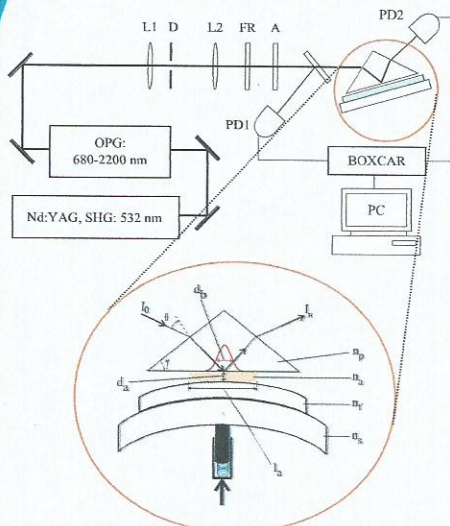
Molecular structure of Polystyrene

Linear Optical Properties

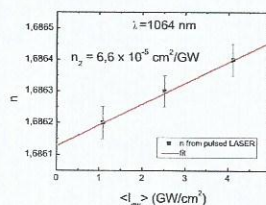
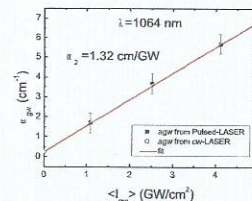
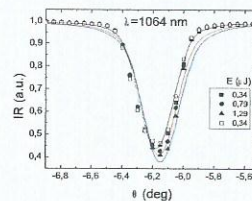


Films were made by spin coating from chlorbenzene solution onto fused silica substrates

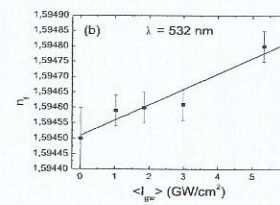
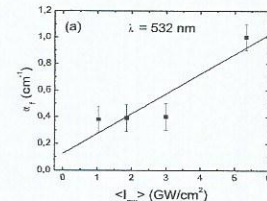
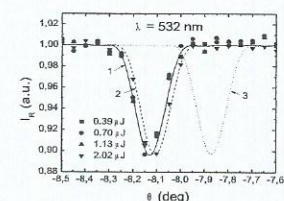
Experimental Setup



Intensity dependent prismcoupling



Results



Parameters (d_b, I_a) were measured and d_a was determined at low intensity. All parameters were kept constant. Only the incident intensity I_0 was varied and two parameters (n_2, α_{gw}) were used to fit the intensity dependent coupling curves [3].

Conclusion:

- n_2 and α_2 -values of PS are 2.6×10^{-14} cm²/W and 1.5×10^{-10} cm/W, respectively.
- The value of n_2 of PS reported by Hu et.al.[2] is about 23 times higher of n_2 of ours.

Acknowledgements

References