

U.M.Neves, M.R.Cardoso, L. Misoguti, C. R. Mendonça
Instituto de Física de São Carlos - USP - São Carlos, SP, Brazil

Abstract

The goal of this work is to investigate the effect of different metals in the two-photon absorption cross-section of azoaromatic chromophores. The organometallic compounds studied here are based on the Salen Dye azo-compound, where Copper, Nyquil and Vanadium were chemically introduced in the molecular structure. For this investigation it was used the well known Z-Scan technique with 150 fs pulses at 700 nm. The obtained results revealed that the two photon absorption cross section do not change considerably with the metal. It could be noted that the two-photon absorption cross-section magnitude are higher than the observed for regular azoaromatic molecules. Such a effect was attributed to the presence of two azoaromatic groups per molecule.

Samples

All samples studied were dissolved in N-metil-2-pirrolidone (NMP), with concentrations of $5 \cdot 10^{17}$ molecules/cm³, and placed in a 2-mm thick quartz cuvette. The absorption spectra in the UV-Vis region, obtained with a Cary 17-A spectrophotometer, are presented in Figure.2.

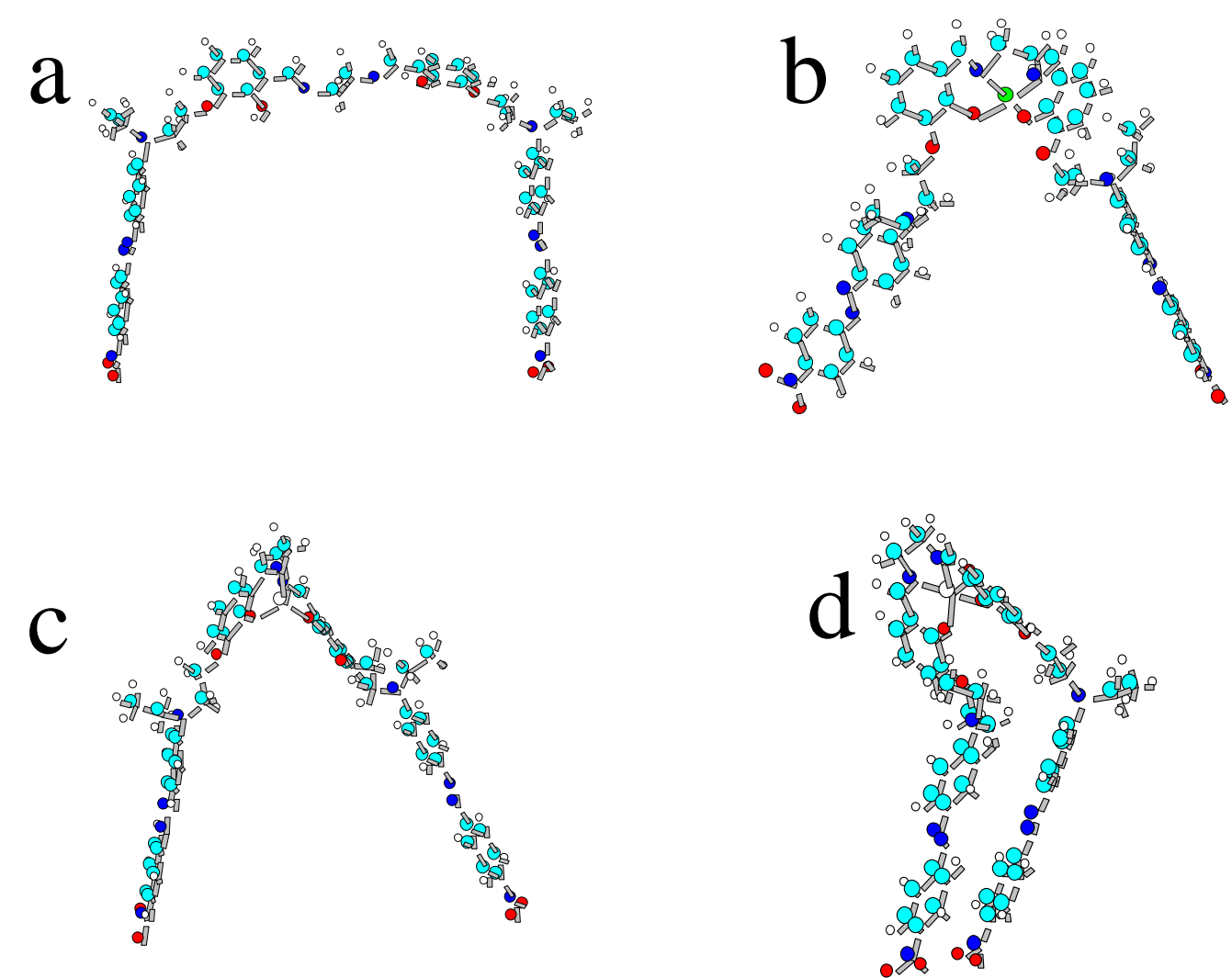


Figure 1: Molecular structure of the studied samples.

- a: Salen Dye
- b: Salen Dye Cu
- c: Salen Dye Ni
- d: Salen Dye VO

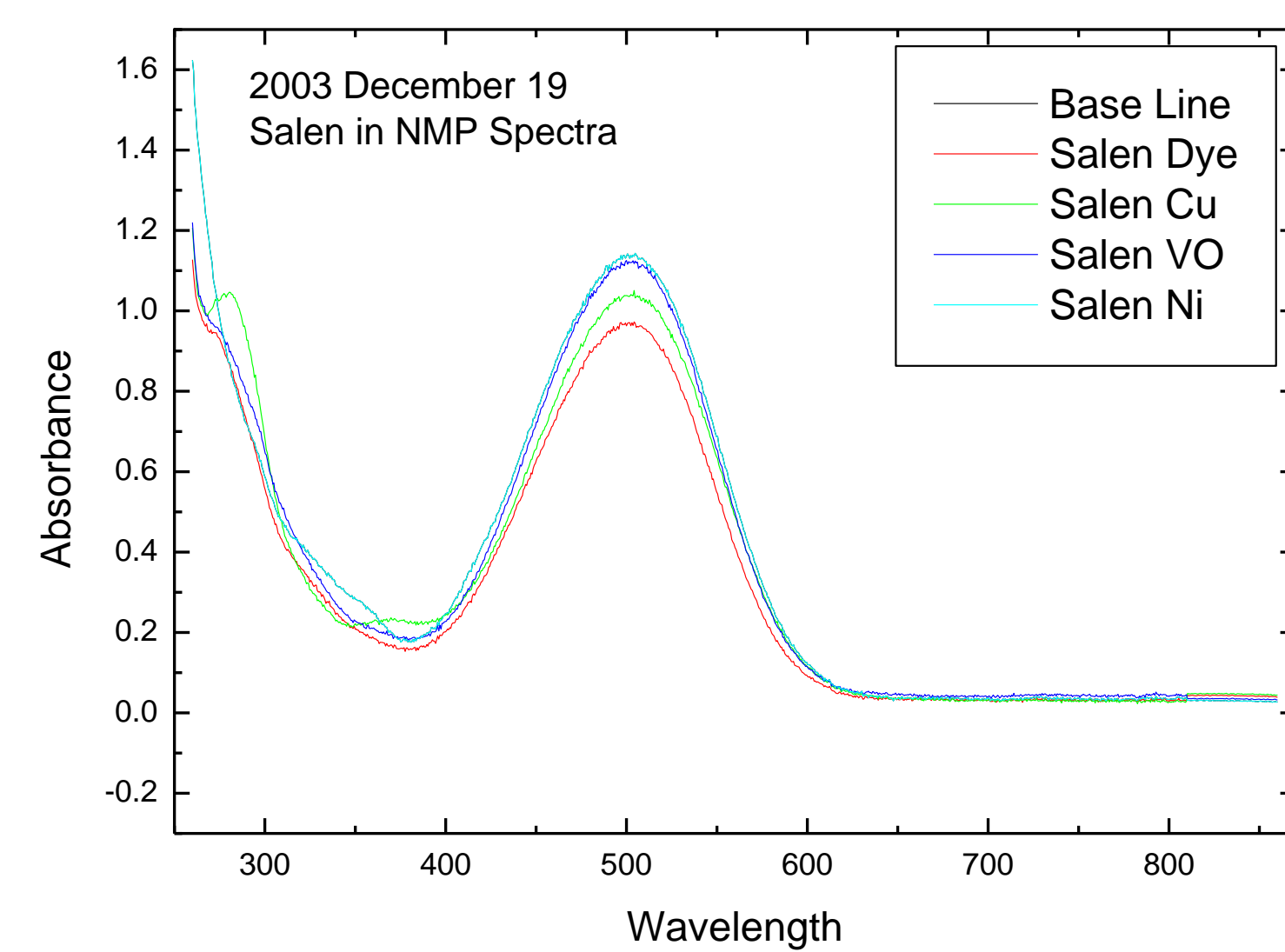


Figure 2: Absorption spectra of the studied molecules in NMP solutions.

Results

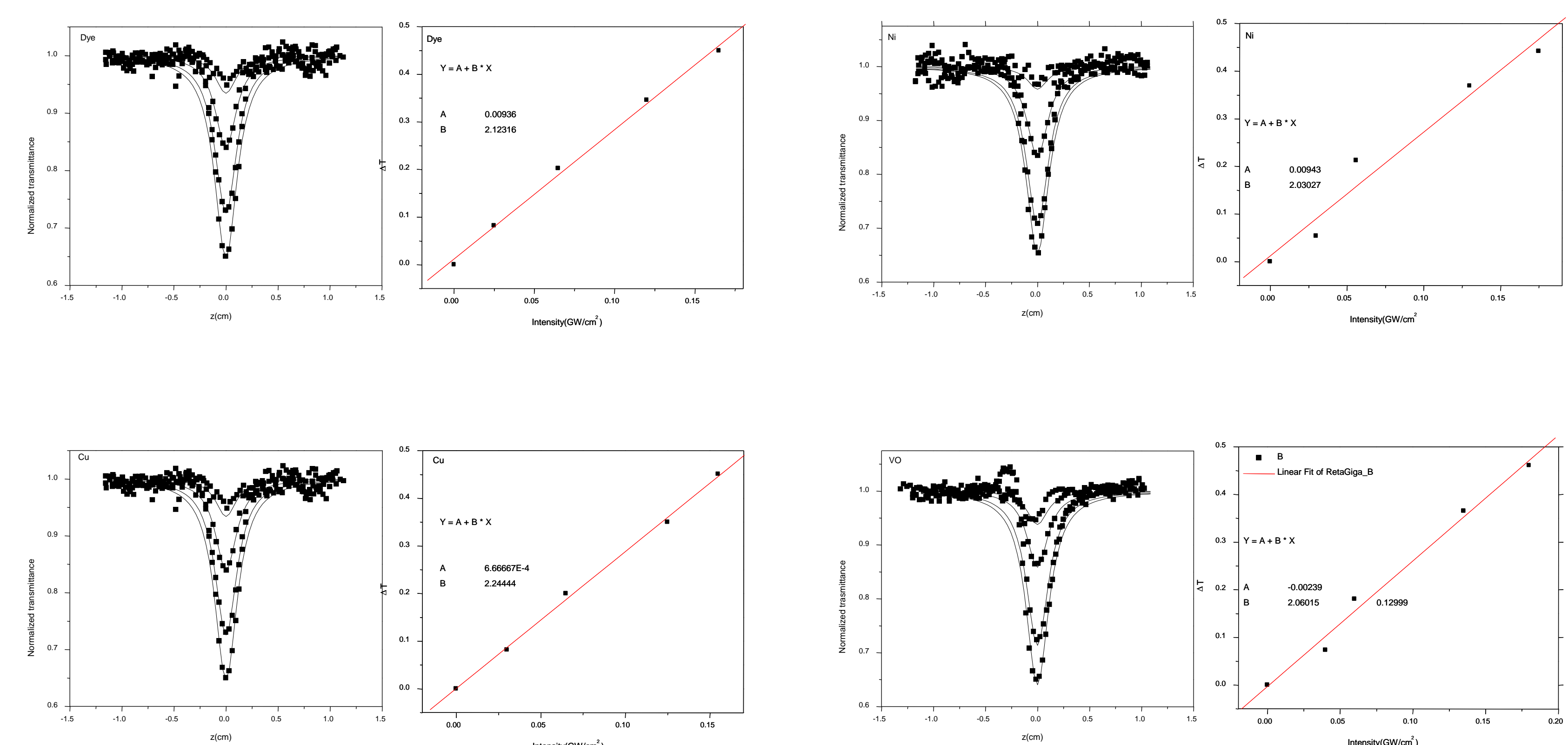


Figure 4: Z-scan signature for the studied samples performed with 120 fs pulses at 700 nm. The solid lines represent theoretical fittings with the parameters given in the Table 1. At the right side of each Z-scan curve we present the normalized transmittance as a function of excitation laser irradiance.

Table 1

| Compound | Concentration (10^{17} molecules/cm ³) | \pm a 700 nm 10^{48} cm ⁴ /photon.s |
|-----------|--|---|
| Salen Dye | 5 | 7 ± 1 |
| Salen Cu | 5 | 8 ± 1 |
| Salen Ni | 5 | 7 ± 1 |
| Salen VO | 5 | 7 ± 1 |

Experimental Setup

Open aperture Z-scan experiments were performed using laser pulses from an optical parametric amplifier (TOPAS, from Light Conversion) pumped by 150 fs pulses at 775 nm delivered by a commercial Ti:sapphire chirped pulse amplified system (CPA-2001 from Clark-MXR Inc.), operating at a 1 kHz repetition rate.

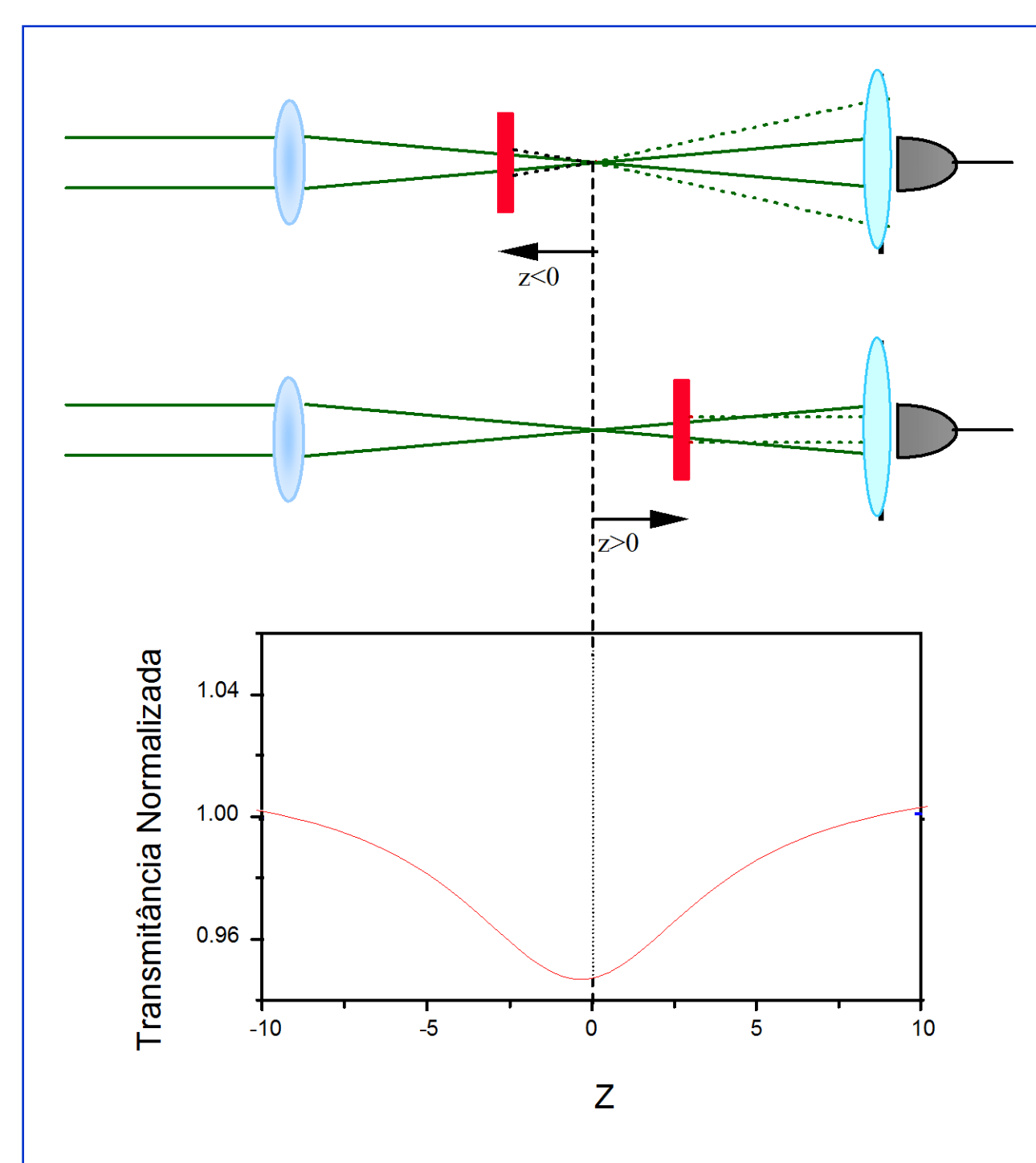


Figure 3 – Open aperture Z-scan experimental setup.

Conclusion

In summary our results indicates that the presence of different metals do not influence the two-photon absorption cross section of the organometallic compounds studied here at 700 nm. In order to complete this investigation we have started absorptive Z-scan measurements as a function of the excitation wavelength.