Temperature dependence on the one- and two-photon excited fluorescence of MEH-PPV

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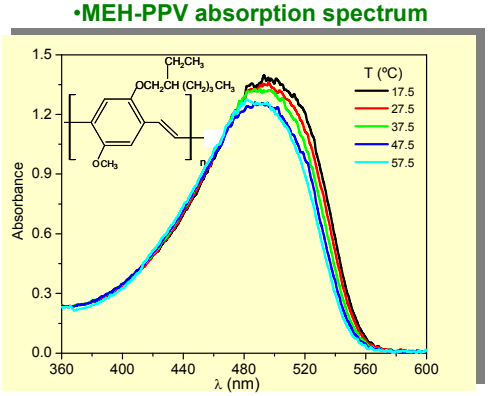
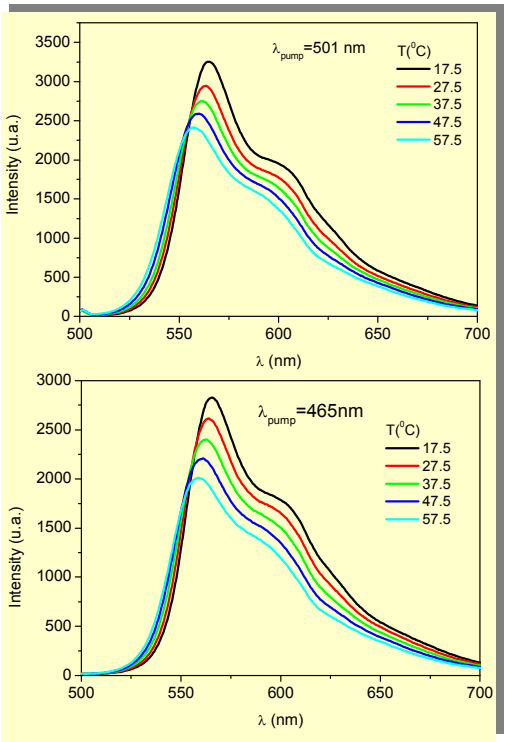
We investigated the influence of the temperature on the fluorescence spectra of MEH-PPV/chloroform solution for several excitation wavelengths, including off-resonance wavelengths. The results showed that as the excitation wavelength moves towards the UV region, the blue-shift trend of emission caused by the raise of the temperature is attenuated, as well as the decrease in the fluorescence intensity. Such behavior was attributed to the excitation of less conjugated segments of the polymer when the pumping wavelength is far from the π-π* transition at 490 nm, which are not greatly affected by conformational changes induced by temperature.

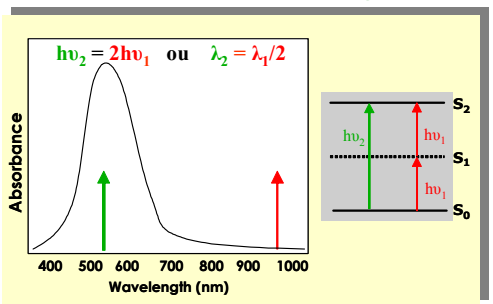
•MEH-PPV absorption spectrum

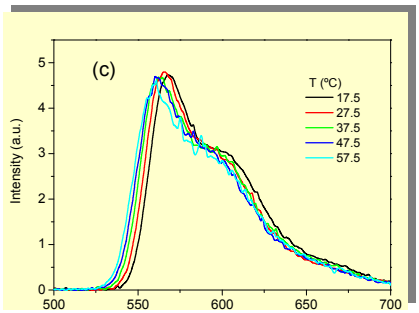


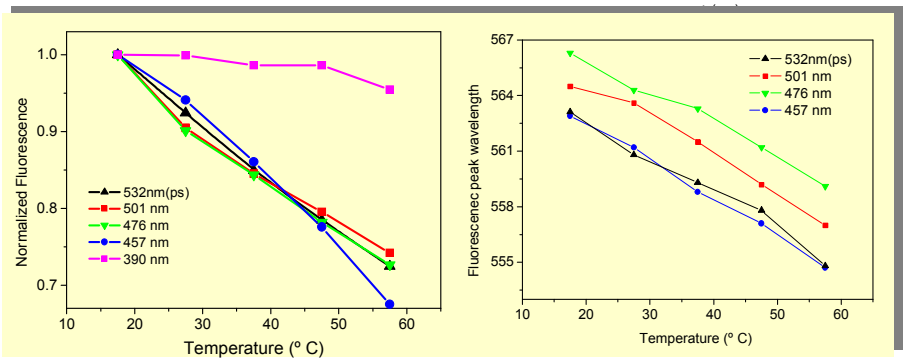
•Fluorescence signal X Temperature (1PA)



•Fluorescence signal X Temperature (2PA)







Our results show that the when MEH-PPV is pumped by laser pulses at wavelengths closer to the π-π* transition (490 nm), the fluorescence signal is strongly diminished by the raise of the temperature. However, when the excitation wavelength is in the blue-region, far from the absorption peak at 490 nm, the fluorescence signal is not greatly affected by high temperatures. This behavior is depicted for an excitation via 2PA at 780nm, which yields to a transition at 390 nm. This phenomenon may have origin due to the excitation of dissimilar segments of the molecules when distinct pump wavelengths are employed. At excitation wavelengths near to the UV region, only less conjugated segments of the macromolecules (or molecules with a few repeating units, such as dimers, trimers etc) are excited. The emission properties of these less conjugated segments are not greatly affected by conformational changes induced by the temperature, differently of the π - π* transition around 500 nm, which reflects the excitation of non-localized electrons of the backbone. In the blue region, the amplitude of the fluorescence signal does not change by rising the temperature probably because the decaying time is not affected by less conjugated segments.

✓ References

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