Improvement of photoresponsive fluorescent devices is of crucial interest for optical switches applications\(^1\)\(^,\)\(^2\) (nanoprobes for microscopy, optical memory devices...). In this frame, our recent investigations are related to photochromic and fluorescent systems for which the fluorescence can be modulated. Competitive processes are involved after a photoexcitation. Fluorescence and photochromic reaction can especially take place from the same excited state. Our work is focused on two closely related diarylethene\(^3\) (DAE) with oxidized benzothiophene rings (Figure 1) which have very close structures. The only differences between these two molecules are the substituents on the reactive carbons (methyl or ethyl groups).

These molecules are both fluorescent under their open and closed forms but show very different photophysical properties. These differences have been investigated by steady state and time-resolved spectroscopy measurements, including nanosecond and femtosecond transient absorption. This investigation, performed in different solvents, provided a complete picture of these DAE photophysical mechanisms. Moreover, DFT and TD-DFT calculations were performed to support our experimental results.

**References**


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**Figure 1:** Photochromic reaction for the studied compounds (X=Et or X=Me)

**Figure 2:** Left: Fluorescence decay of DAE-Et in open form (blue) and closed form (green); right: transient absorption spectra of DAE-Et.