Charge-transfer color emission in new organosilicon compounds

The general purpose of this research project is a full description of the spectroscopic and photophysical properties of the selected organosilicon compounds containing carbazole moiety.

Organosilicon compounds are of interest as light-emitting materials because of their attractive photo- and electroluminescence properties. Moreover, introduction of silyl moieties improves some properties of these materials *i.e.* film-forming ability, processability, solubility and flexibility. Silicon atom between conjugated chromophores acts as an insulating spacer namely breaks conjugation between chromophores tuning color of emission. Another benefit resulting from incorporation of silicon atom is an enhancement of the fluorescence efficiency and red shift in absorption and emission spectra. Among other candidates for new light-emitting materials there are known examples of compounds containing carbazole moiety. This choice is determined by the large hole mobility of carbazole, its strong absorption in UV range and highly efficient fluorescence.

This research project includes two major directions: the first part of the research will be focused on answering the question what is the influence of silicon atom on the emission properties of the selected organosilicon compounds. This scientific problem will be discussed for selected organosilicon compound and its carbon analogue. The comparative analysis with the respective carbon analogues will show the influence of silicon atom on the photophysical properties. The second part of the research will focused on designing new series of the *charge-transfer*-like compounds. The idea is to bridge by silylene linker two different chromophores which exhibit non-visible emission (UV region) to achieve color emission originating from electron transfer between connected parts. The concept of proposed model of designing **Donor-SiR$_2$-Acceptor** compounds is to use measurable criteria (e.g. oxidation and reduction potentials, distance between donor and acceptor moieties, coupling between the interacting states) to predict whether electron transfer is / is not possible on a stage of planning synthesis. This idea is intended to be an alternative for so-called 'try and check' synthesis, which is time consuming, expensive and at the end the emission properties of the obtained product may not be attractive. The desired *electron-transfer* emission should characterize high intensity and location in the visible range so that these compounds will be attractive in terms of their potential utility as light-emitting materials (*e.g.* light-emitting diodes LEDs).

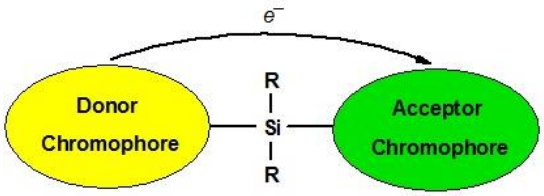

Fig. 1 Schematic presentation of model compound in which electron transfer (**ET**) is possible to occur.