



# Synthesis of $\pi$ -conjugated polymers containing siloxane sidechains



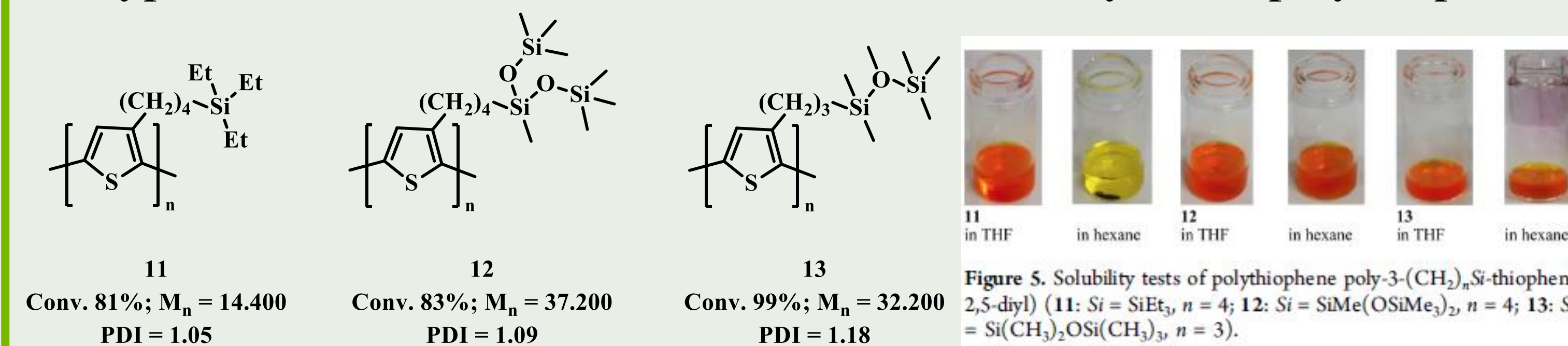
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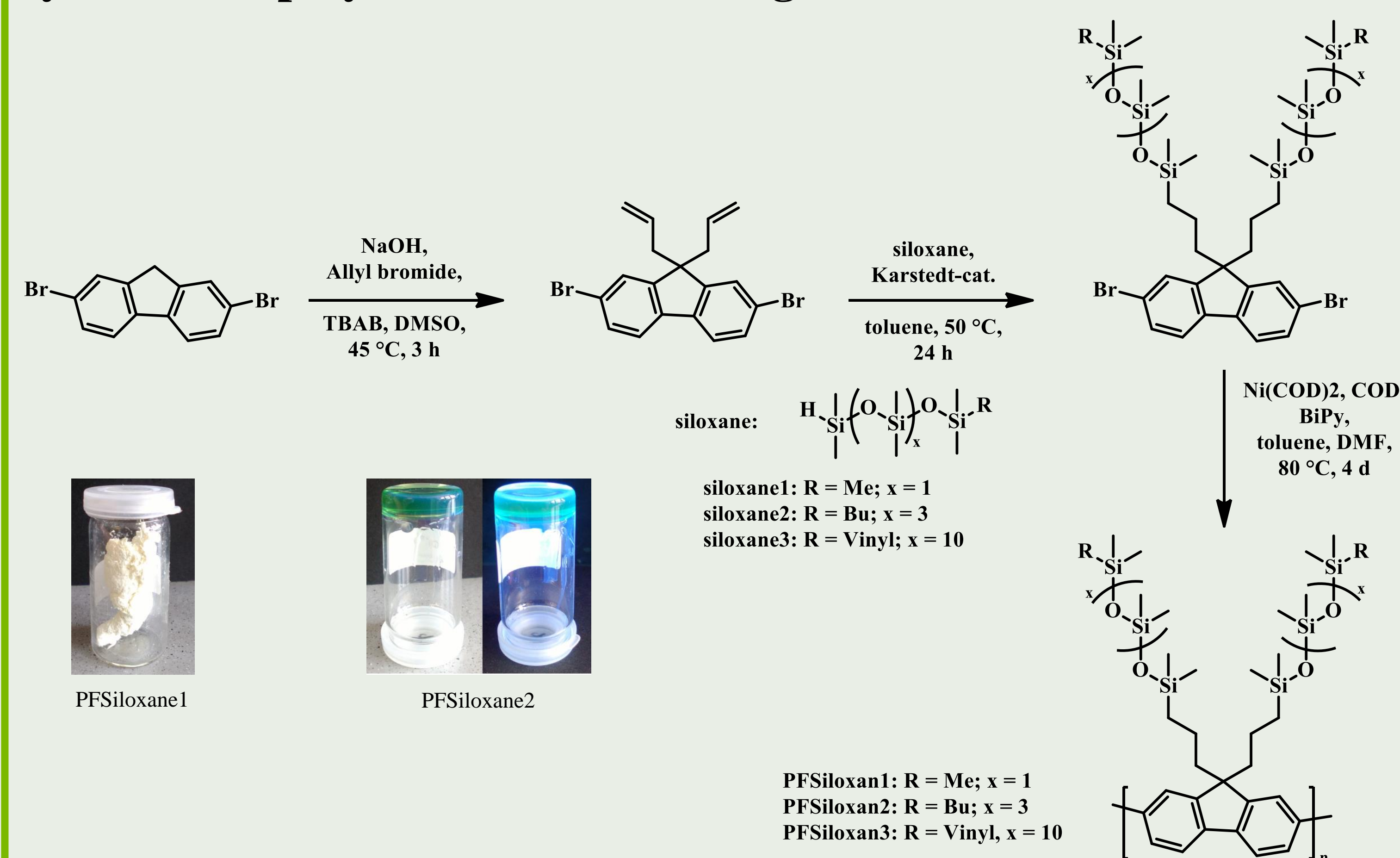
Oligo- and polysiloxanes (e.g. PDMS) are very important for our daily life. Since the siloxane structure combines organic and inorganic structural elements, special properties result, that differ from pure organic polymers. For example, PDMS shows a high temperature- (till 250 °C) and UV-stability and a good chemical resistance. Due to these properties, also conjugated polymers (polythiophenes) containing siloxane side chains are of increasing attractiveness.<sup>1</sup> Such polymers can show a remarkably high solubility in hydrocarbon solvents like hexane.<sup>1</sup>

## Polythiophenes known from literature:<sup>1</sup>

The type of side chain has an influence on the solubility of the polythiophene:



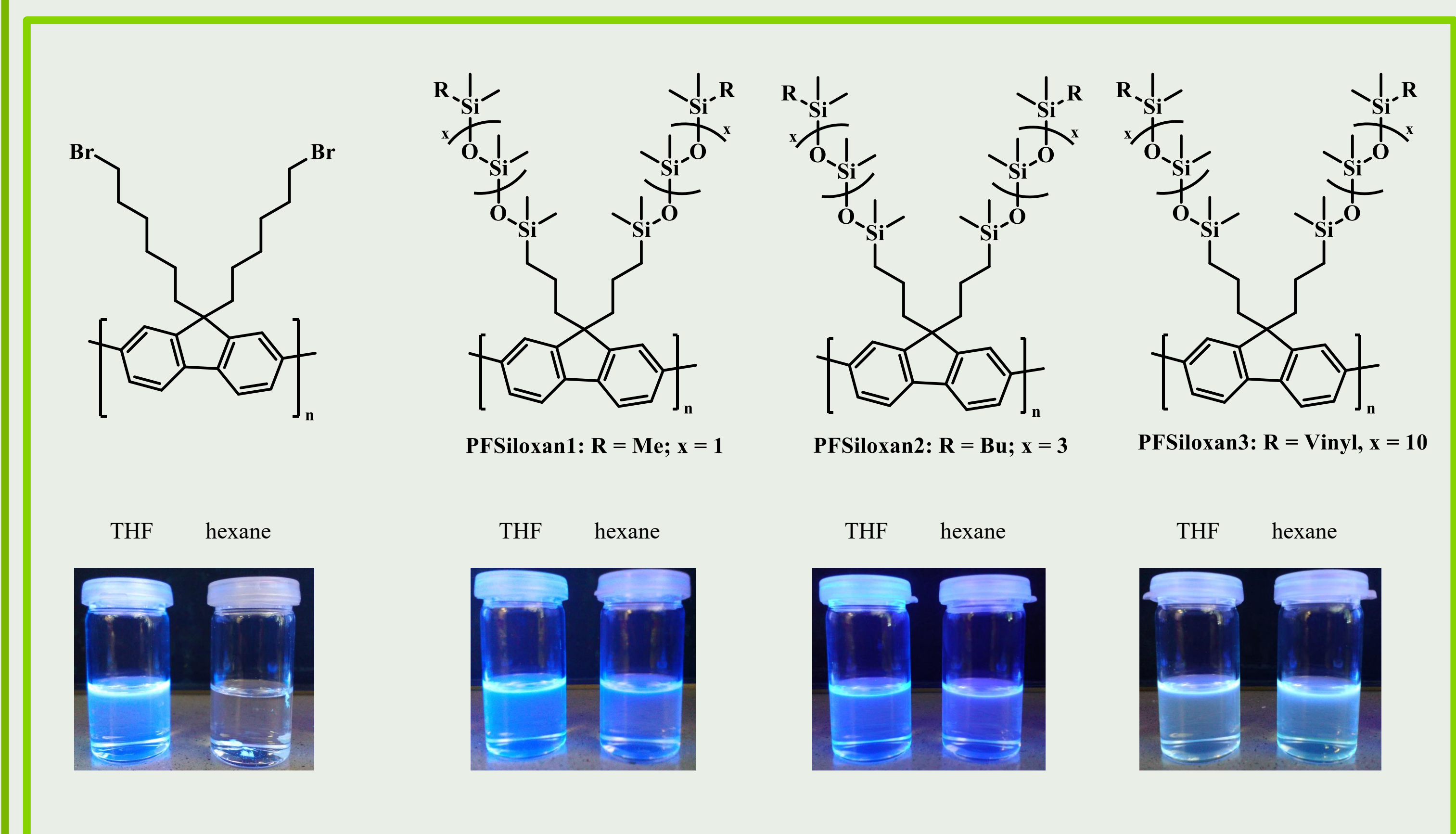
## Synthesis of polyfluorenes containing siloxane side chains:



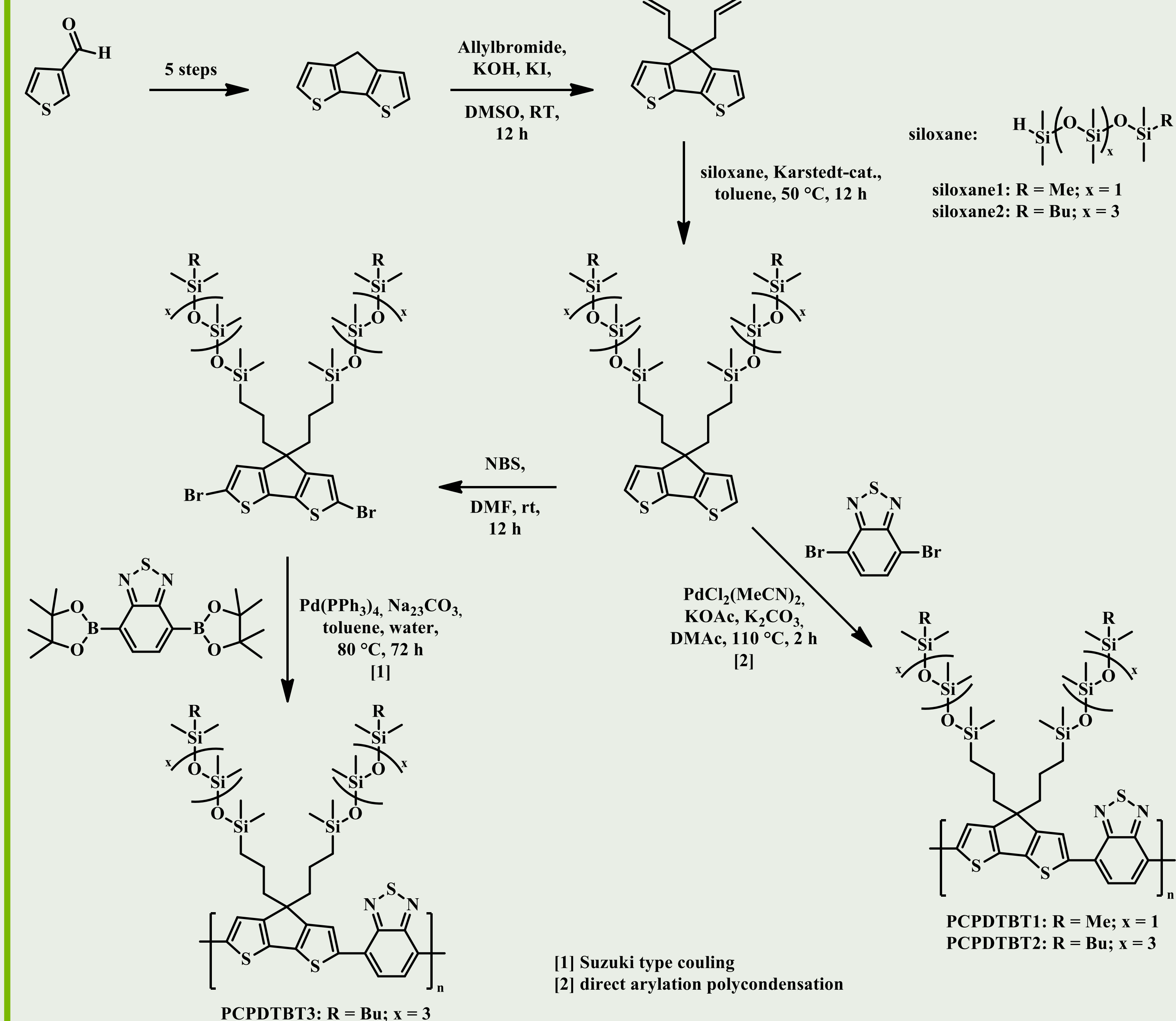
## GPC results and optical properties of the polymers:

polymer	M <sub>n</sub> [g/mol] (extraction solvent)	PDI	UV/Vis [nm]		PL [nm]	
			CHCl <sub>3</sub>	film	CHCl <sub>3</sub>	film
PFSiloxane1	36.600 (Hexan)	5,35	390	392	415; 440	426; 452
PFSiloxane2	94.900 (Hexan)	2,37				
PFSiloxane3	51.100 (EE)	2,17	370	370	410; 431	421; 446

**Solubility tests of the different polyfluorenes compared to polyfluorene with alkyl side chain (saturated solution, fluorescence with excitation at 380 nm):**



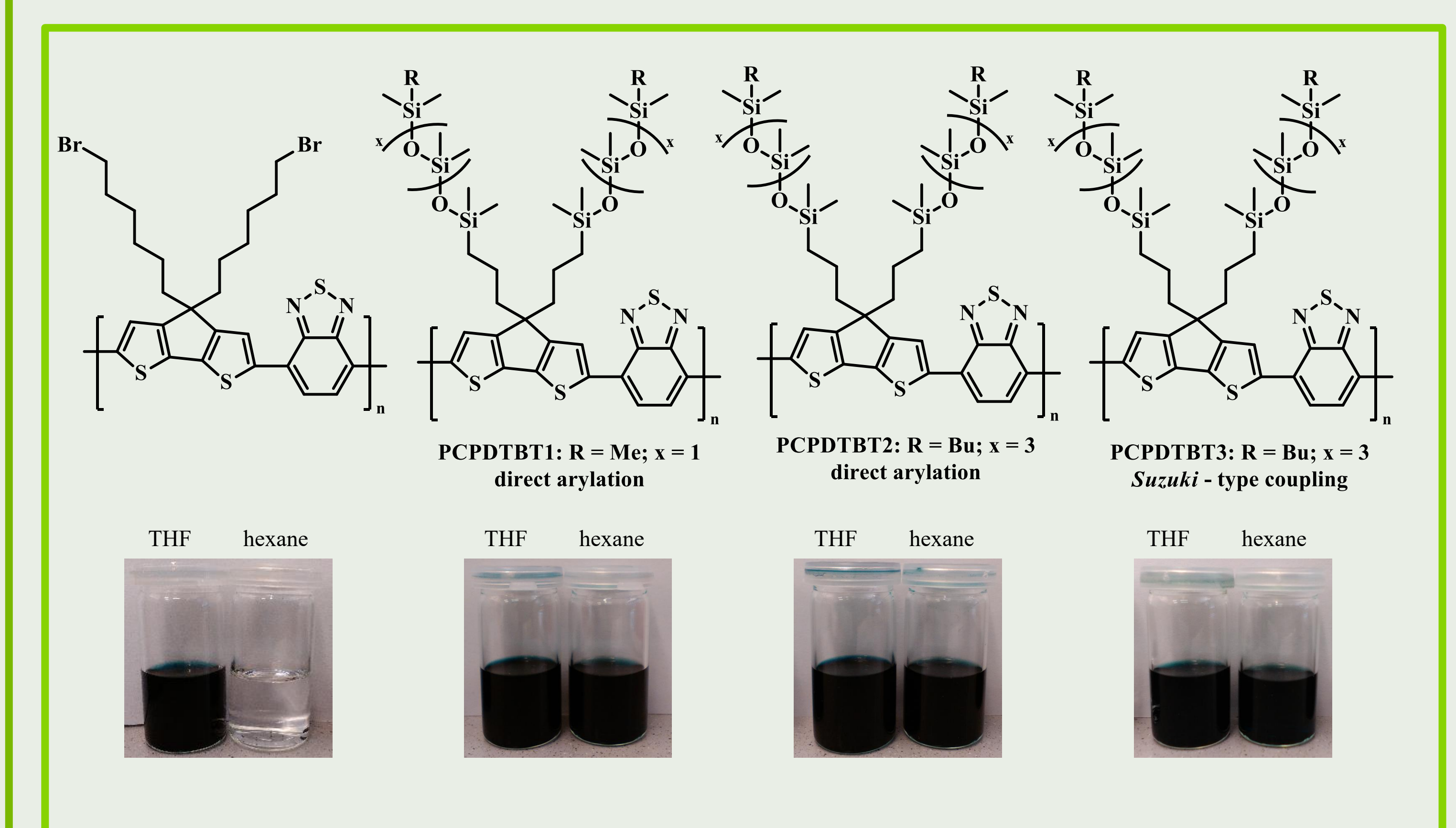
## Synthesis of the donor-acceptor copolymer PCPDTBT containing siloxane side chains:



## GPC results and optical properties of the polymers:

polymer	M <sub>n</sub> [g/mol] (extraction solvent)	PDI	UV/Vis [nm]		PL [nm]	
			CHCl <sub>3</sub>	film	CHCl <sub>3</sub>	
PCPDTBT1	16.400 (BuOH) 19.900 (EE)	5,97 5,33	401; 689	421; 777	776	
PCPDTBT2	27.400 (iPropanol) 12.300 (BuOH)	9,00 3,26	406; 692	421; 737	784	
PCPDTBT3	35.500 (BuOH)	7,34	412; 718	424; 764	799	

**Solubility tests of the different PCPDTBTs compared to PCPDTBT with alkyl side chain (saturated solution, absorption):**



## Conclusion

We have investigated novel conjugated polymers containing linear siloxane side chains and different  $\pi$ -conjugated polymer backbones. These polymers merge the properties of conjugated polymers with the properties of siloxanes. All synthesized polymers show strongly increased solubility in polar solvents as well as in aliphatic hydrocarbon solvents.