

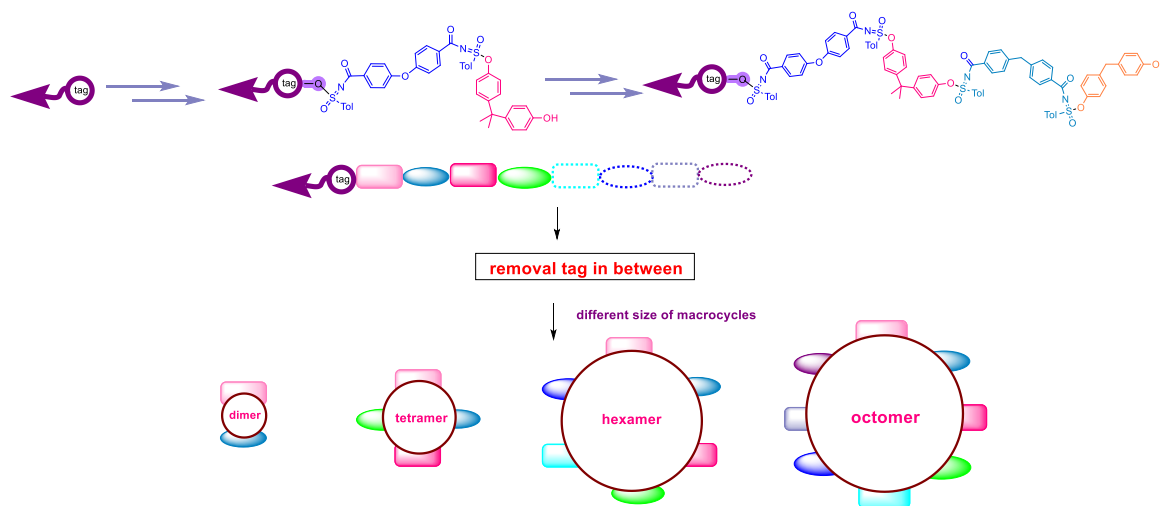
**Group** : Laboratory of Organic Chemistry  
**Project** : **Sequence-defined macrocycles via Sulfur-fluoride exchange reaction**  
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**Keywords.** Macromolecules synthesis, SuFEx click reaction, fluorous-tag strategy

**Introduction.** The nature has many biological polymers, such as proteins and nuclei acid. These kinds of biopolymers have perfectly defined length and sequences. We call these uniform macromolecules as sequence-defined oligomers or polymers.<sup>[1]</sup> Sequence-defined oligomers are of great importance and regarded as holy grail in polymer science.<sup>[2]</sup> Because of its great potential, chemists have devoted to developing the methods to synthesize man-made sequence-defined polymers. Click reaction <sup>[3]</sup> is one of the most popular types of reaction in growing the sequence-defined oligomer chains owing to its fast reaction speed, high yield and conversions which could enable the polymer chains grow longer in a short time. Sulfur-fluoride exchange reaction (SuFEx) is another click reaction reported by Sharpless in 2014.<sup>[4]</sup> Currently, we exploit SuFEx click reaction to synthesize man-made sequence-defined oligomers and we are perusing a higher control to the synthesized sequences.

**Goal.** Recently, our group synthesized SuFEx-based oligomers with different sequence and length. Intriguingly, we found the cap on the oligomer chain might be removed effectively by Sulfur-Phenolate Exchange reaction (SuPhEx).<sup>[5]</sup> In this thesis project, we planned to connect the tail and the head of the linear sequence by SuPhEx reaction to make sequence-defined macrocycles with difference ring sizes. The appropriate monomers of di-SF and di-phenol with long enough chains, flexibility and solubility will be investigated in growing oligomer chains and the reaction condition of forming different sizes of macrocycles will be tuned.



**Topics to be studied.** This project will exploit SuFEx reaction to grow the linear oligomer chains with different length and sequence and perfluoro-tagging technique to simplify the purification process. Furthermore, the SuPhEx reaction will be used to remove the chains and form the macrocycles with different ring sizes.

#### **Techniques to be used.**

Organic synthesis under inert atmosphere, Fluorous-solid phase extraction (FSPE), TLC, column chromatography, NMR, GPC, HR-Mass.

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