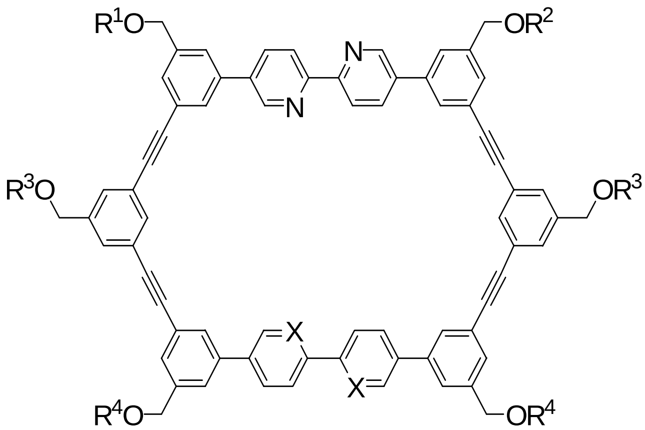
2. Aim of the work

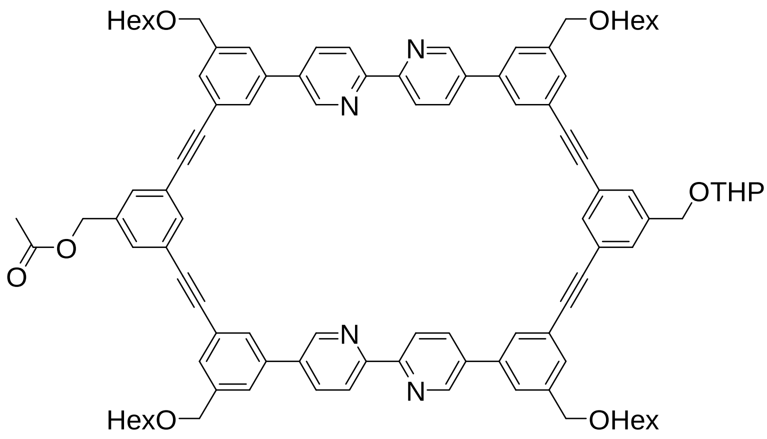
As mentioned in the introduction shape persistent macrocycles have a considerable applicational potential. Despite the numerous representatives prepared up to date,[1c] the synthetic access to most of them is still tedious and complicated. This specifically refers to those cycles which have bipyridine or terpyridine units in their backbone. This is why in present work in the first place aims at improving and streamlining the synthetic sequences and procedures to cycles like **A** and **B** (Figure 5). This involves not only modifications in strategy but also attempts to avoid the use of hazardous tin compounds (for Stille-type cross-coupling) and unnecessary chromatographic purification steps.



A: R^1 = THP, R^2 = R^3 = R^4 = Hex, X = N
B: R^1 = R^2 = R^3 = R^4 = Hex, X = CH

Figure 5. Bipyridine macrocycles with one or two bipyridine units and different substitution pattern.

A second independent point was seen in the development of strategies that allow to not only use symmetrical but rather non-symmetrical building blocks. This is important for the field of cycle synthesis in general because this way the cycles' peripheries can be engineered almost at will through the introduction of a tunable functional group pattern like is illustrated, e.g., in structure **C** with three different peripheral functional for solubilization and further orthogonal modification (Figure 6).



C

Figure 6. Macrocycle **C** with its functional groups pattern.

For future usage of cycles in the synthesis of controlled 2D network it was an additional goal to devise a route to hexagonal cycles with more bipyridine units, preferentially three. This is why this work also undertaken an attempt in this direction.

Having accomplished all these aspects it was considered important to develop the chemistry of the cycles themselves and to do steps with them toward potential applications. The first category comprises of experiments attaching transition metals complexes (especially Ru and Os) to the bipyridine units in order to investigate the photophysical properties of the resulting symmetrical and non-symmetrical complexes. An interesting prototype is shown in Figure 7.

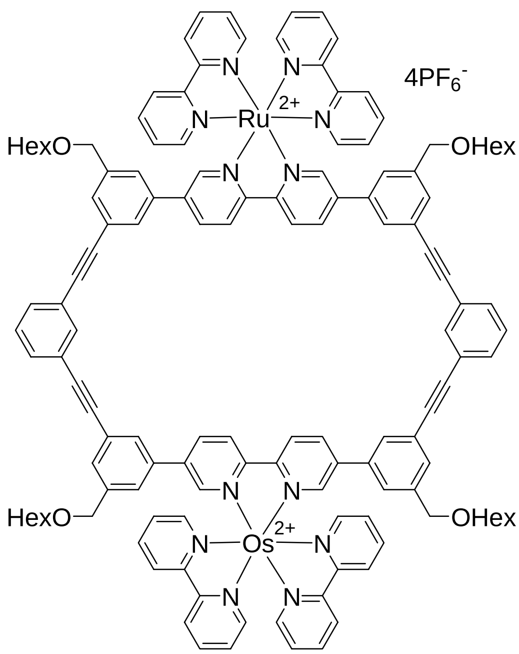


Figure 7. A mixed Ru/Os complex of bipyridine macrocycle.

The second category comprises macrocycles' experiments like dendronization and polymerization after the appropriate modification. This should lead to an improved aggregation behavior and which could be important under material science aspects (Figure 8).

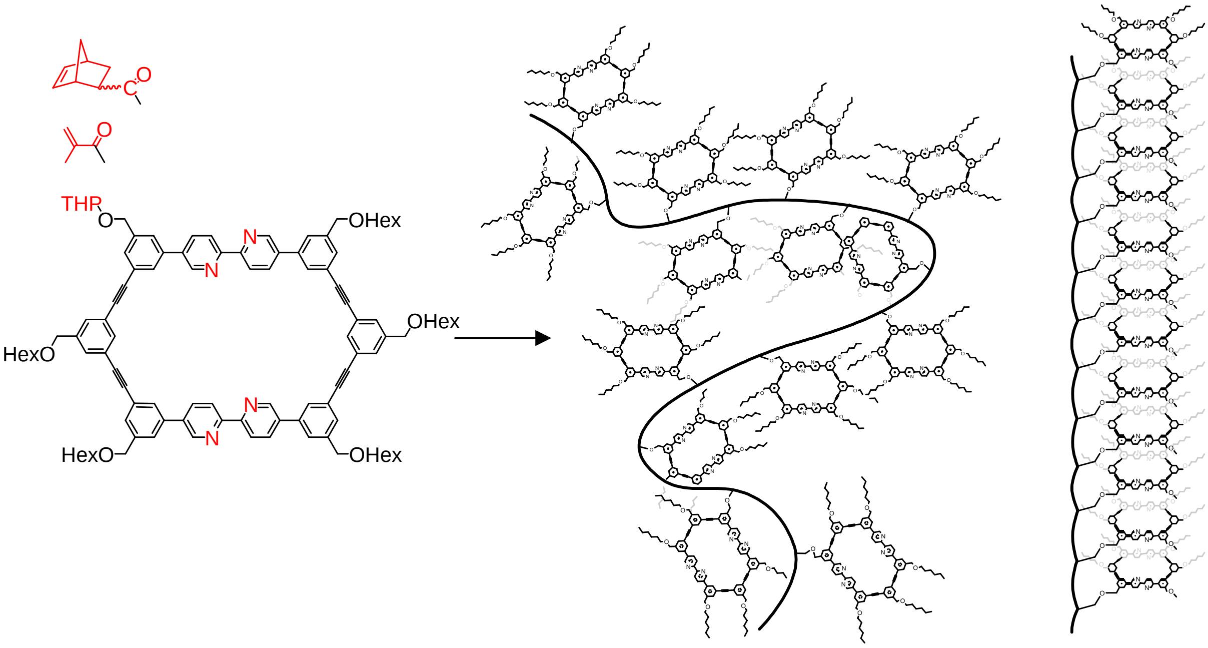


Figure 8. Cartoon representation of polymerization of macrocycles after appropriate modification.

X-ray analysis of single crystals provides us with the information about the packing behavior of the macrocycles in the solid state. Finally, first orienting experiments into the cycles' bulk behaviour specifically under the aspect of their potential liquid crystallinity should be done.