

CHAPTER IV

CONCLUSION

Seventeen derivatives of calix[4]arenes containing multiple diyne units were successfully synthesized through modified Cadiot-Chodkiewicz coupling reaction as a key step. The study of solid-state polymerization of these compounds has demonstrated, for the first time, that intramolecular topological 1,4-addition of diyne is possible, provided by appropriate structural design of the monomers. There are, at least, three structural features required for the derivatives of calix[4]arene containing multiple diyne units to undergo topological polymerization. First, the derivatives should consist of four diyne units substituted on the phenoxy *O* of the narrow rim to provide the right symmetry for the molecular packing in their solid state. Second, a strong hydrogen bond forming group, such as the carbamate group, should be present in the diyne chains to achieve the required topological distances and angles. Third, steric factors strongly affect either inter- or intramolecular distances between the active carbon atoms in the diyne units. The solid-state topological polymerization of calix[4]arenes containing four diyne units by γ -ray provide a route to synthesize an eccentric polydiacetylene containing double ene-yne conjugated chain and calix[4]arene baskets. The polymers can self-assemble to form nanodisks with an average diameter of ~150 nm that can be well dispersed in water, tetrahydrofuran and dimethylformamide. The polymers also exhibit reversible thermochromic transition between red and yellow near 120 °C.

Suggestions for future works

1. Grow single crystals of the photo active and inactive calix[4]arene derivatives to obtain their X-ray structure to confirm the proposed topological alignment.
2. Study colorimetric or fluorescent responses of the polydiacrylenes for chemosensing applications.
3. Synthesis of calix[4]arene derivatives containing four diyne fatty acids and study their solid-state polymerization.