Summary of Contents of Doctoral Thesis

Title of Doctoral Thesis: Highly photosensitive 6π-electrocyclization and self-contained photoacid generators based on terarylene backbone

Name: Ruiji LI

Photochromic compounds **1a** and **2a** based on diarylbenzo[*b*]thiophenes were exhibited highly efficient 6π-electrocyclization reaction in polar medium with non-symmetrical structures. The combination of electron-deficient and electron-rich aromatics as side aryl units was considered to reinforce a CH/π interaction between the electron-rich aryl ring and the methyl group attached to the electron-deficient aryl unit, which is highlighted in methanol, stabilizing the photoreactive conformation.

Then a series of self-contained photoacid generators based on compound **2a** were designed and studied in order to extend the research. The PAGs which can release methanesulfonic acid and acetic acid exhibited a quantum yield (QY) in toluene is ~0.60. Changing the sequence of aromatic rings connections according to the previous research, **PAG-5a** was designed which gave QY ~0.70 for photoacid generation.**PAGs-1a** and **5a** could serve as a photoinitiator of cationic polymerization of cyclohexane oxide. The most efficient **PAG-5a** could induce the acid catalyzed chemically amplification photo-pattern formation on a positive-tone resist film.

A newly photoacid generator **PAG-6a** for more versatile compatibility toward any of photopolymer systems was investigated. Some of photo-polymerizable epoxy monomers are polymerized not by normal acids but by much stronger acids so-called as "Super-Acid", such as CF_3SO_3H. Mono-substituted epoxy monomers are the example of such less reactive monomers. It was failed to prepare CH_3SO_3- derivatives of compounds **PAGs-1a** and **5a**. **PAG-6a** discussed here poses modified terarylene backbone being possible to release CF_3SO_3H under ambient condition with photochemical quantum yield of 2 to 3 times larger than those of previous super PAGs.

All the research above should attract interest from the fields of fundamental organic photochemistry, polymer chemistry, fabrication process and even of photo-active bioscience.