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Major Research Interests: **Organophosphorus materials for optoelectronic applications;**
Chemistry of Phosphinidene complexes: carbene like chemistry of monovalent phosphorus.
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1. Electrophilic terminal phosphinidene complexes:

Synthesis of exotic structures

These deficient electron species described here are thermally generated in situ from their corresponding 7-phosphanorbornadiene complexes .They behave as singlet carbenes and have a very rich chemistry[1]. We report here, only one of its multiple reactivities: their [1+2] cycloaddition with alkenes and alkynes leading to the 3-membered rings phosphirane and phosphirene complexes[2,3,4]. (Fig.1).

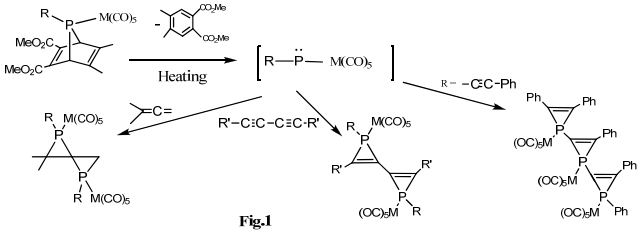

Fig.1

Optoelectronic design

We use phosphirene as conjugating spacer in thiophene oligomers[5] (Fig.2) to help modulate properties of polythiophenes. We are still far from useful optoelectronic polymer but nevertheless " this synthesis is the first and key step for developing π-conjugated organic materials", as reported in *Chemical & Engineering News* (**2006**, 84, 12) .

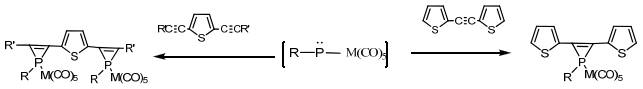

Fig.2

Umpolung of electrophilic terminal phosphinidene complexes by interaction with nucleophilic carbenes

We isolated indeed a stable phosphinidene-carbene 1:1 adduct with a nucleophilic phosphorus[6]. We are currently exploring the synthetic possibilities of these nucleophilic species.

2. Phosphole-Thiophene Oligomers for optoelectronic applications:

We use the phosphorus 5-membered ring, the phosphole, to modulate the electronic band gap of polythiophenes. By an easy way, we succeed to get a novel family of Phosphole-Thiophene Oligomers[7] (Fig. 3). For example, the 1-methyl-2-terthienylphosphole-borane fluoresces at 510nm in CH_2Cl_2 with a quantum yield of 0.17 while the terthiophene fluoresces at 420nm with a quantum yield of 0.06.

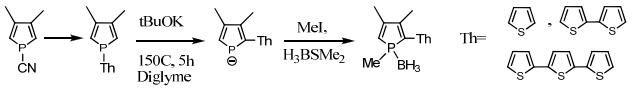

Fig.3

References:

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5. N. Hoa Tran Huy, E. Perrier, L. Ricard, F. Mathey, *Organometallics*, **2006**, *25*, 5176.
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