Chatchawan Ploysuk. 2007: Part I: Synthesis of (±)-Isagarin, (±)-Marticin and (±)-Isomarticin by Palladium(II) Catalysis Part II: Stereoselective Palladium(0)- Catalyzed Four-Component Cascade synthesis of Pyrrolidinyl isoquinolines. Doctor of Philosophy (Organic Chemistry), Major Field: Organic Chemistry, Department of Chemistry. Thesis Advisor: Associate Professor Boonsong Kongkathip, Ph.D. 176 pages.

Part I: Pyranonaphthoquinones are known as the important sources of biologically active compounds. Some of these are structurally quite complex such as (-)-isagarin (11), isolated from the roots of *Pentus longiflora*, (+)-marticin (12) and (+)-isomarticin (13), isolated from the culture extraction of fungi. (±)-Isagarin (11) has been synthesized in 5 steps in 24.1% overall yield from 3-allyl-2-bromo-1,4-dimethoxynaphthalene (116). (±)-Marticin (12) and (±)-isomarticin (13) have been synthesized from vanillin in 15 steps with 0.27% overall yield or from hydroquione in 14 steps with 0.36 % overall yield.

The synthesis of (±)-Isagarin (11) started from the 3-allyl-2-bromo-1,4-dimethoxynaphthalene (116) which was prepared from 2-bromo-1,4-naphthoquinone (114). Coupling of 2-bromo-1,4-dimethoxynaphthalene (116) with benzyloxy-acetaldehyde (119) or (tert-butyl-dimethyl-silanyloxy)-acetaldehyde (121) followed by removal of protecting groups (benzyl or silyl) gave olefinic diol (126). Wacker reaction ($PdCl_2$, $CuCl_2$, O_2) of olefinic diol (126) and subsequent oxidation with CAN provided the desired Isagarin (11).

(±)-Marticin (12) and (±)-isomarticin (13) have been successfully synthesized from 1,2,4,5,8-pentamethoxynaphthalene (147). The starting material, 1,2,4,5,8-pentamethoxy naphthalene (147) was prepared from either commercially available vanillin (141) or hydroquinone (154). The key synthesis of (±)-marticin (12) and (±)-isomarticin (13) from 1,2,4,5,8-pentamethoxynaphthalene (147) involved the introduction of a masked acid side chain(132) into the naphthoquinone ring via Friedel-Craft acylation, introduction of an allyl group via radical reaction and the formation of the dioxabicyclic ring by the Wacker reaction.

.

Part II: Multi-component reactions (MCRs) play an important role in combinatorial chemistry because of its ability to prepare complex molecular architectures from readily available building blocks. Among the advantages of MCRs are yields that higher than almost any sequential synthesis of the same target and a single purification step. Herein, we reported a new type of MCR to synthesize pyrrolidinyl isoquinoline derivatives using a four component-cascade with 2-iodobenzyldehyde to generate azomethine ylides in situ. The azomethine ylides are1,3-dipoles and are immediately trapped with *N*-methyl maleimide (NMM) as the dipolarlophile to form pyrrolidinyl isoquinolines. We also studied the mechanism of this reaction and its stereochemical outcome.

_____ _____ ___ / ___ / ___

Student's signature Thesis Advisor's signature