

## Synthesis, Characterization, and Liquid Crystalline Properties of Phosphazenes Incorporated (*E*)-3-(4-alkyloxyphenyl)-1-(4-hydroxyphenyl)prop-2-en-1-one

Norashikin Irdawaty Abdul Rahman<sup>a</sup> and Zainab Ngaini<sup>b</sup>

<sup>a</sup>Department of Research and Development, Malaysian Pepper Board, Jalan Utama, Bintawa Industrial Area, P.O Box 1653, 93916 Kuching, Sarawak, Malaysia

<sup>b</sup>Department of Chemistry, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 93400 Kota Samarahan, Sarawak, Malaysia.

Email: [norashikin@mpb.gov.my](mailto:norashikin@mpb.gov.my)

**Abstract :** A series of new substituted cyclotriphosphazenes were prepared by reaction of hexachlorocyclotriphosphazenes, (N<sub>3</sub>PCl<sub>2</sub>)<sub>3</sub> separately with one and six equivalent of (*E*)-3-(4-alkyloxyphenyl)-1-(4-hydroxyphenyl)prop-2-en-1-one (**2a-c**) in the presence of base to afford mono[(*E*)-3-(4-alkyloxyphenyl)-1-(4-hydroxyphenyl)prop-2-en-1-one (**3a-c**) in 18-27% yields and hexakis[(*E*)-3-(4-alkyloxyphenyl)-1-(4-hydroxyphenyl)prop-2-en-1-one (**4a-c**) in 71-88% yields, respectively. All the synthesized compounds were characterized via elemental analysis (CHN), FTIR, and <sup>1</sup>H, <sup>13</sup>C and <sup>31</sup>P NMR. Their molecular structures were further ascertained through <sup>1</sup>H-<sup>1</sup>H Correlation Spectroscopy (COSY) and Heteronuclear Multiple Quantum Coherence (HMQC). The texture observation was performed under polarizing optical microscopy (POM) over heating and cooling cycles.

**Keywords :** hexachlorocyclotriphosphazenes, chalcones, alkyloxy

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### Introduction

Phosphazenes are cyclic or linear molecules that contain a framework of alternating phosphorus and nitrogen atoms [1]. Studies on linear, cyclic and polyphosphazenes have been widely investigated. These compounds were reported to possess interesting biomedical properties [2] and promising application such as effective flame retardants for fiber materials [3]. Nucleophilic substitution reactions of cyclotriphosphazenes have been widely reported. Nucleophilic substitution reactions normally involved the replacement of chlorine atom from P-Cl bonds by various nucleophiles such as phenols [4,5], amine [6] and azo [7] groups.

Phosphazenes skeletal system has been used in the field of photo reactive materials. Synthesis of cyclotriphosphazenes bearing cinnamates [8] and hydroxychalcones [9] as side groups had been studied for photosensitive phosphazenes that could undergo photocross-linking reaction under UV irradiation. In photochemistry, chalcones was

reported to possess non-linear optical (NLO) property [10] for optical communications and optical electronics, liquid crystals for liquid crystal displays (LCD's) [11,12] and alignment film [13]. It was also reported to promote excellent blue light transmittance and good crystallizability [14,15], high photosensitivity and thermal stability for various crystalline electro-optical devices.

In this paper, we aim to synthesis mono- and hexa-substituted cyclotriphosphazenes bearing chalcones derivatives possessing long alkyl chains ranging from C10 to C14 which could be used as a potential liquid crystal compounds.

### Results and Discussion

The series of chalcone derivatives (*E*)-3-[4-(alkyloxy)phenyl]-1-[4-hydroxyphenyl] prop-2-en-1-one (**2a-c**) were first prepared via Claisen-Schmidt condensation of **1a-c** with 4-hydroxybenzaldehyde by the route depicted in Scheme 1.