

# Theme: Functional Material

## Subject : Design of High Refractive Index Monomer

### Introduction

High refractive monomer is one of most important materials used in several applications, such as planar waveguides, flat panel displays, optical sensors, high-brightness LEDs, OLEDs, integrated optical devices (photonic crystals), diffraction gratings, optical data storage and so on.

Refractive indices are determined by the polarizabilities of the combined groups in a molecule. Contributions to the refractive indices are higher for carbon atoms than for hydrogen atoms. Since carbon atoms dominate the structure of most organic materials, most common organic materials have a refractive index near 1.5. Organic materials with strongly electronegative substituent, such as fluorine and oxygen, will have lower refractive indices. Substituent with a high polarizability over a large atomic area, such as sulfur, phosphorus, bromine, and iodine, tend to have higher refractive indices.

The goal of this research project is to design of high refractive index monomer that can increase the performance of optical applications.

### Scope

Challenges that significantly advance the state-of-the-art the design of high refractive index of monomer include:

- High refractive index of over 1.70
- Synthesize monomer potentially suitable for UV curing process.
- Halogen-free material
- Monomer is easy to handle with viscosity lower than 1500 cps at 50°C

### Research questions

We are interested in the following research questions. These questions are not exhaustive but different research questions are open to discuss with research partners.

- What is the maximum refractive index achievable with organic materials?
- Are there any other organic components compatible for monomers to increase the refractive index?
- Is it possible to reduce the yellowness effect after UV curing process using high refractive index monomer?

### Expected Deliverables

The following is open to discussion:

- Suggestion of new materials or new structure
- Detailed progress reports every 3 months summarizing accomplishments.
- Prototype samples
- Patents with Samsung Cheil industries (if agreed)