

# Theme: Functional Material

## Subject : Novel Hard coating Materials on Optical Substrate

### Introduction

The optical substrate, such as, PMMA, PET, PC and PI are being used because they are lightweight, provided with superior durability, and flexible. However, the substrate material is provided with low surface hardness, and due to the limit in the physical/chemical characteristic thereof poor abrasion resistance and solvent resistance, a wider use of the plastic material is limited. As to resolve the difficulties as such, various types of functional hard coating material are being developed. Particularly, the development of the coating material using organic/inorganic hybrid material being produced through a sol-gel processing is being a mainstream. However, such a hard coating is provided with high brittleness so, there are surface crack phenomena when the substrate is bent.

The goal of this research project is to design of novel hard coating materials that can increase the surface hardness and flexural endurance.

### Scope

Challenges that significantly advance the state-of-the-art the UV curable hard coating materials include:

- High pencil hardness over 8H after cure process
- Curl free UV curable hard coating materials on thin substrate.
- There is no surface crack phenomena during flexural bending test (100,000 cycle, 5mm under bending radius)

### 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.

- How can we reduce the curl problem during curing process of hard coating material?
- Is it possible to dramatically increase the surface hardness and flexural endurance at the same time?
- Is it possible to reduce the yellowness effect after UV curing process using hard coating materials?

### 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)