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**Total internal reflection by grazing incidence for coherent perfect absorption of a transparent polymer film on a transparent substrate****Takayoshi Kobayashi***The University of Tokyo, Japan*

In this study, we demonstrate that Coherent Perfect Absorption (CPA) can be achieved for a nearly transparent sample in the visible range using a simple configuration: a single dielectric layer sandwiched between semi-infinite dielectric layers. Specifically, we use a transparent PVP film between  $\text{MgF}_2$  and air, creating a Fabry-Pérot (FP) resonator with total internal reflection (TIR) at the air interface. When collimated white light is incident nearly normally from the substrate side, a transmission dip greater than 92.6% is observed from the opposite side of the film.

The conditions necessary for CPA in this single-layer thin film configuration are: (I) the transparent thin film must have minimal absorption, (II) the refractive indices must satisfy  $n_1 > n_0 > n_2$ , where  $n_0$ ,  $n_1$ , and  $n_2$  represent the refractive indices of the substrate, the thin film, and the surrounding medium, respectively, and (III) the configuration must involve grazing incidence. The condition (II) ensures that light can enter the thin film when incident from the substrate side, with high reflectivity at the substrate-thin film interface and TIR at the thin film-surrounding medium interface. The grazing incidence requirement (III) is essential to approximate CPA conditions. For transparent materials with near-zero absorbance ( $q$ ), reflection at the interface between  $n_0$  and  $n_1$  ( $|r_{01}| \sim 1$ ) is necessary. Grazing incidence facilitates  $|r_{01}| \sim 1$  even with a small refractive index difference ( $\Delta n$ ). Thus, a range of substrate-thin film combinations of transparent dielectric materials could enable CPA for future applications and studies, including combinations of solid-solid, solid-liquid, or liquid-liquid materials.

**Biography**

Takayoshi Kobayashi has completed his PhD at The University of Tokyo (UT), Reseacher at Riken, an emeritus professor of the UT, Guest professors of Tokyo University of Science, University of Electro-Communications, Director of Advanced Ultrafast Laser Center of National Chiao-Tung University, He has published >650 papers in reputed journals and has been serving as a Chief Editor of Applied Sciences.