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Functional Fluorinated Polyimides and Optical Components Developed for Lightwave Applications

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This talk will review the optical properties of recently developed fluorinated polyimides (FPIs) that exhibit outstanding optical transparency as well as excellent thermal, mechanical, and electric properties for applications to optical components for lightwave circuits, in particular for optical inter-connection and telecommunication applications [1–4]. The optical transparency of FPIs in the near-infrared (NIR) region has been improved by reducing the harmonic oscillations of infrared absorptions, resulting in "*perfluorinated polyimides*". In addition, newly developed methods for controlling the transparency, refractive indices, in-plane and in-plane/out-of-plane birefringence, and thermo-optic coefficients of FPIs will be demonstrated [5-11]. A wide range of applications of FPIs to lightwave components, such as single- & multi-mode waveguide circuits, flexible substrates for WDM filters, transmission-type and reflective-type thin and flexible half & quarter waveplates, and 15 μm-thick FPI linear polarizers. will be presented. Recently, we have developed novel athermal birefringent FPIs whose optical retardations are insensitive to temperature. In addition, we have found that strong fluorescence with the three primary (red, green, and blue) and whitish colors can be emitted from specially developed semi-aromatic FPI films. We call this series of FPIs as "*highly fluorescent fluorinated polyimides*". We'd like to explain that partially and perfluorinated polyimides are inherently versatile functional materials for the future telecommunications, optical inter-connect systems, and lighting systems for flat displays.

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