Abstract of Presentation

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Presentation Title(Should be no more than 20 words):

Status of Photonics Polymers for "Fiber-To-The-Display"

Abstract :

Photonics polymers have been put into practical use as pickup lenses for CD and DVD players, liquid crystal displays (LCD), plastic optical fibers (POF), etc. As photonics polymers have unique properties that cannot be found in inorganic glass, they are beginning to hold their own position as materials in the fields of optics and photonics. However, photonics polymers also have their own problems that prevent the upgrade of photonics polymer devices and expansion of their applications. The problems that have been noted are lower clarity, larger birefringence, larger wavelength dispersion of refractive index, lower optical uniformity, etc., compared with optical glass. These problems have been considered as unavoidable properties peculiar to photonics polymers because they are caused by complex systems of polymer solids being an aggregation of huge molecular chains. Therefore, it has been thought that photonics polymers were not suitable for applications in the next generation photonics, which require longer-distance transmission, less distorted transmission of ultra high-speed signals, more accurate control of polarized waves, sharper focusing, more amplification, etc. But, is it really true?

In order to investigate this matter, it was necessary to discuss molecular structures of polymers as well as higher order structures such as conformation and configuration of polymer chains. We studied in detail about how polarized waves or photons relate to various polymer chains (angstroms), their aggregation (several hundred angstroms), higher order structures, and huge heterogeneous structures, investigating their origins. Based on those basic researches, we have proposed and demonstrated "photonics polymers" with new optical functions for applications in photonics fields such as Graded-Index Plastic Optical Fiber (GI POF) that achieved more than 40 Gbps data transmission for optical communication, Highly Scattered Optical Transmission (HSOT) Polymer for LCD backlight almost twice as bright as the conventional "transparent" backlight, and zero-birefringence optical polymer for high quality display. Introducing these novel photonics polymer materials, we are proposing "Fiber-To-The-Display" concept, where GI POF network is directly connected to the high-definition display of homes and offices, by which real time face to face communication with clear motion pictures can be realized. Further details will be introduced in my presentation.