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# Hybrid electro-optic polymer waveguide modulators

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Electro-optic (EO) polymer modulators have demonstrated high performance including a large bandwidth of 110 GHz, and a low half-wave voltage ($V_\pi$) of 0.65 V at 1550 nm.[1] These results were achieved because of a high in-device EO coefficient of 142 pm/V in Mach–Zehnder (MZ) modulators at 1550 nm, and similar refractive indices of the milliwave and optical waves (e.g., difference of 0.1) of the materials used.[1] Hybrid EO polymer/sol-gel modulators have realized the highest possible in-device poling efficiency of ~100% because the electrical conductivity of the sol-gel cladding is two orders of magnitude higher than that of the EO polymer layer.[2] We report the optical transmission stability of the hybrid sol–gel silica/EO polymer waveguide modulators. The three-dimensional beam propagation method showed stable waveguiding in the waveguide, as long as the index of the EO polymer core was higher than that of the sol–gel core. The optical transmission for an optical input power of 30 mW at a wavelength of 1550 nm did not change for >1200 h[3]. We also report a novel electro-optic (EO) polymer/$TiO_2$ multilayer slot waveguide for low voltage and high-speed modulators. The EO polymer is sandwiched between thin $TiO_2$ slot waveguide films to improve mode confinement in the EO polymer.

## Biography

Yasufumi Enami obtained Ph.D. degree from Optical Sciences Center, University of Arizona in 2003. He has worked as Research Associate in Optical Sciences Center, University of Arizona, and Kyoto University Japan. He also worked in College of Optical Sciences as Research Scientist from 2005 to 2008. He is currently working as Professor, Special Appointment in Hiroshima University from 2008. His current research topic is polymeric modulators and biophotonic sensors based on planar waveguide devices. He published several breakthroughs in the field of polymeric modulators in Nature Photonics as a lead author in 2007 and Applied Physics Letters.

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