

Advanced Materials and Devices for Ultrafast Molecular Photonics

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We have been developing polymers showing ultrafast absorption changes (photoinduced electrochromism) in the visible to near infrared regions by photoinduced electron transfer and reverse reactions or by excited electronic state formation. We have achieved responses with less than 1 ps for both ON and OFF processes of transient absorption in about 1300–1600 nm range. Guided wave mode (GWM) geometry composed of a prism, a metal or low-refractive index polymer thin film, and a photoresponsive polymer film successfully achieved sensitive, all optical, and very fast control of reflectance by transient or persistent changes of GWM conditions by means of photoinduced complex refractive index changes upon nanosecond to femtosecond laser excitation. All-optical parallel control of reflected probe light by pump (writing) light, which can be used for all-optical correlation, modulation, recording or display, was demonstrated by several photoresponsive materials including the photoelectrochromic polymers newly developed.