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Helical light induced chiral surface relief in azo-polymer thin film

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Light induced surface reliefs on azo-polymer films have been intensely studied through mass transport arising from an optical gradient force, anisotropic photo-fluidity, and *cis-trans* photo-isomerization, and they provide us to develop optical devices, such as hologram, active waveguides and photonic circuits. The mass transport occurs typically to direct the azo-polymer from a bright region toward a dark region along the polarization direction of the light, thereby inhibiting a spiral surface relief formation in the azo-polymer by linearly polarized light illumination. Optical vortex, i.e. light with a helical wavefront, carries unique features, such as its annular intensity profile and orbital angular momentum, and it has been widely investigated in various applications, for instance, optical trapping and manipulation, optical telecommunications, and a super resolution microscope. Recently, we and our co-workers discovered, for the first time, that optical vortex enables the formation of a single-arm chiral surface relief in an azo-polymer with the help of the spin angular momentum assigned by the circular polarization. Such chiral surface reliefs have the potential to be utilized to develop new optical devices, including chiral metasurfaces and plasmonic holograms for identification of the chirality of chemical composites with high accuracy and sensitivity. In this presentation, we detail the chiral surface relief formation in the azo-polymer by optical vortex illumination, and we also address the physical mechanism of the chiral surface relief formation by utilizing an analytical formula for the optical radiation force induced in an isotropic and homogeneous material by irradiation with a continuous-wave optical vortex.

Biography

Takashige Omatsu is currently serving as the Director at the Optical Society (OSA), a Deputy Editor of Optics Express, and a Director of Photonics Division, Japan Society of Applied Physics (JSAP). Furthermore, he has worked as a committee member in many international conferences. He was elected as an OSA fellow and a JSAP fellow. He has been working on structured materials fabrication based on optical vortex illumination. He has published over 200 journal and conference papers, and has attended over 100 invited presentations of international and national conferences.

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