**Tight Focusing of Laser Light Using Microlens Array Combined with Radially Polarized Light Converter**

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The surface energy of the glass surface and CYTOP surface can be calculated by the theory proposed by Fowkes. The solid surface free energy is the sum of polar component and dispersion component according to Eq. (1) [S1]:

(1)

The surface tension is calculated by the geometric average method, as expressed by the following Eq. (2) [S2]:

(2)

Where is the contact angle at equilibrium, is the surface tension of the liquid, and are the polar and dispersion components of liquid surface tension.

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Fig. S1 (a)-(d) The contact angles of diiodomethane and water on the surface of glass and CYTOP.

By measuring the contact angle of the standard liquid on the solid surface, the surface-free energy can be calculated. As shown in Fig. S1, the contact angles of two standard liquids (Diiodomethane: = 50.8 mN/m, = 48.5 mN/m, = 2.3 mN/m; water: = 72.8 mN/m, = 21.8 mN/m, = 51.0 mN/m) on glass surface and CYTOP surface were measured by Contact angle measurement instrument (Dataphysics, OCA 15EC). The contact angles of diiodomethane on the glass surface and CYTOP surface were 35.6 deg (Fig. S1(a)) and 89.3 deg (Fig. S1(c)). The contact angles of water on the glass surface and CYTOP surface were 5 deg (Fig. S1(b)) and 115 deg (Fig. S1(d)). According to Eqs. (S1) and (S2), the surface energies on the glass surface and CYTOP surface were 72.23 and 13.07 mN/m, respectively.

**References**

[S1]. S. -H. Wu, Polymer interface and Adhesion, Mar-Cel Dekkerinc, New York (1982)

[S2]. F. M. Fowkes, Y. C. Huang, B. A. Shah, M. J. Kulp, T. B. Lloyd, “Surface and colloid chemical studies of gamma iron oxides for magnetic memory media,” Collids Surf. 29(3), 243-261 (1988).