Supporting Information

Synthesis of molecularly imprinted polymers by photo-iniferter polymerization under visible light

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Experimental

Materials

Ethylene glycol dimethacrylate (EGDMA), methacrylic acid (MAA), ethylene glycol methacrylate phosphate (EGMP), 4-cyano-4-[(dodecylsulfanylthiocarbonyl) sulfanyl]pentanoic acid (CDTPA), testosterone, and anhydrous acetonitrile were purchased from Sigma Aldrich (St-Quentin Fallavier, France) and used as received. 2,2'-azobis-(2,4-dimethylvaleronitrile) (ABDV, Vazo-52) from DuPont Chemicals (Wilmington, USA) was also used as received.

[1,2,6,7-3H]-labeled testosterone (activity, 1 mCi/mL; specific activity, 73 Ci/mmol) was from Amersham (Buchinghamshire, UK). Methanol, ethanol, and acetic acid of analytical grade were from VWR International (Strasbourg, France). High-power, multi-chip LED435-66-60-110 and LED525-66-60 were from Roithner LaserTechnik (Vienna, Austria). These light sources displayed a maximum peak at 428 nm and 522 nm, with a FWHM of 19.1 nm and 31.7 nm, respectively, when measured with an Ocean Optics HR2000 spectrometer.

Polymer synthesis

Testosterone imprinted particles (MIPs) were synthesized as follows. In a 20 mL glass vial sealed with a silicone septum, testosterone (43.3 mg, 0.15 mmol), MAA (102.8 µL, 1.20 mmol), EGDMA (707.3 µL, 3.75 mmol), and CDTPA (36.2 mg, 0.087 mmol) were dissolved in anhydrous acetonitrile (11.6 mL). The pre-polymerization mixture was then nitrogen-purged on ice and placed in front of a LED irradiating either blue or green light. The distance from the LED was set in order to measure an average power of 7.5 mW/cm2 with a Coherent PS19Q power sensor. After 24 h, the particles were collected by centrifugation and repeatedly washed with three rounds of methanol/acetic acid (9:1, v/v), two rounds of ethanol/acetic acid (9:1, v/v), two rounds of ethanol and two rounds of methanol. The particles were finally dried overnight under high vacuum.

Reference, non-imprinted polymer particles (NIPs) were synthesized as above except that testosterone was omitted.

Chain extension with p(EGMP) was performed as follows. In a 4 mL glass vial sealed with a screw cap and an air-tight septum, NIP (30 mg) was mixed with CDTPA (4.16 mg, 0.01 mmol), EGMP (106.12 mg, 0.5 mmol), ABDV (0.83 mg, 3.33 µmol) in 2 mL of ethanol. Upon cooling on ice and purging with nitrogen, the pre-polymerization dispersion was then immersed in an oil bath heated at 60 °C and vigorously stirred. After 26 h, particles were collected by centrifugation and repeatedly washed with methanol (5 × 1.5 mL).

Radioligand binding experiments

A series of suspensions containing either MIP or NIP in concentrations ranging from 1 to 30 mg/mL was prepared in polypropylene Eppendorf tubes. 0.4 pmol (30 nCi) of 3H-labeled testosterone was then added to each tube and the final volume was completed to 1 mL with acetonitrile. The tubes were incubated for 12 h on a rotating mixer at room temperature. After centrifugation at 17500 rpm for 30 min, 0.5 mL of supernatant from each tube was pipetted into a scintillation vial containing 4 mL of scintillation fluid (Ultima gold, Perkin Elmer), and the concentration of free radioligand was measured with a Beckman LS 6000 IC scintillation counter.

Polymer characterization

Scanning electron microscopy (SEM) images and energy-dispersive X-ray spectroscopy (EDX) were carried out on a Quanta FEG 250. Upon EDX analysis, polymer particles were sputter-coated with gold before imaging.

The particle size and distribution were determined from SEM images using ImageJ and averaged at least 100 measurements.

Visible spectra were measured with an Analytik Jena Specord 205 spectrophotometer.

Additional plots

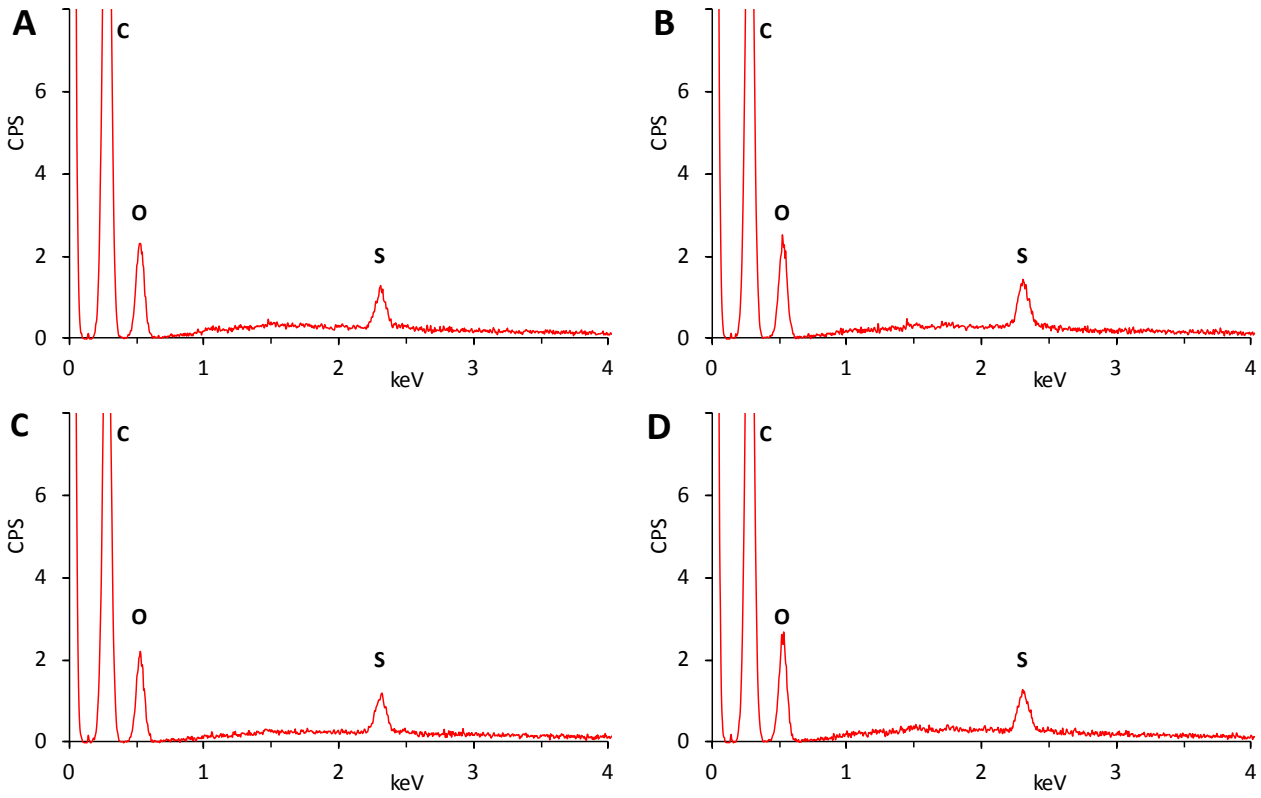

Figure S1. EDX spectra of MIP (A, B) and NIP (C, D) particles obtained using blue (A, C) or green (B, D) light.

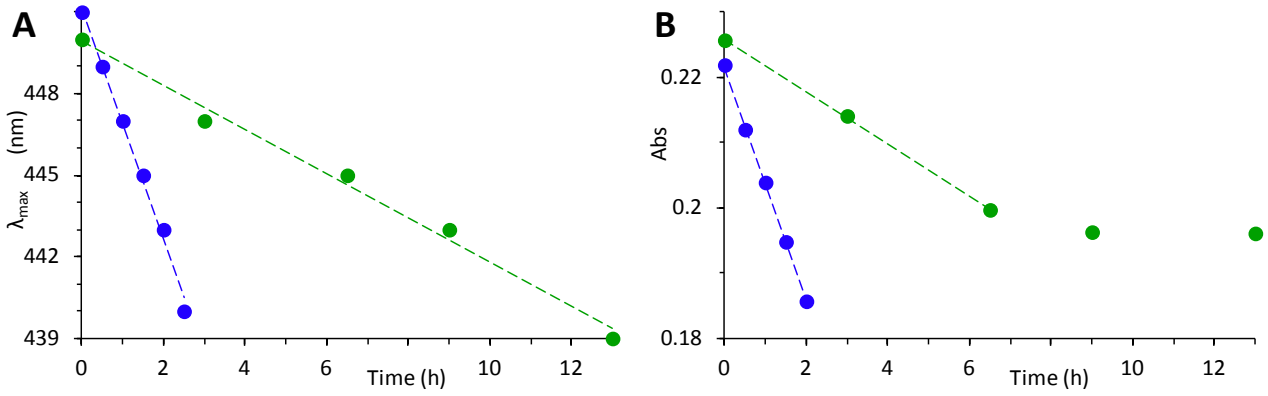

Figure S2: Evolution of λ_{max} (A) and its relative absorbance (B) of a NIP formulation before phase separation under blue (blue circles) and green (green circles) light.