Supporting Information

Scheme S1: Schematic illustration of the microfluidic synthesis of the monodisperse PILs microgels and the chemical structures of the used ionic liquid monomer and cross-linker.

Scheme S2: Schematic illustration of the counteranion-exchange reaction of the prepared PIL microgels.
**Scheme S3:** Schematic illustration of the preparation of patchy microparticles by using a “sandwich” microcontact printing (μCP) method.

**Scheme S4:** Schematic representation of the preparation of Au-PIL hybrid microgels.
**Figure S1.** FTIR spectra of the fabricated PIL microgels before and after the exposure to different anion aqueous solutions.

**Figure S2.** TGA date of the Au-PIL hybrid microgels with a heating rate 5K/min in a flow of air.

**Figure S3:** EDX spectrum of Au-PIL hybrid microgels.