

Fluorescence turn-off sensing of Fe(III) by carbon dots synthesized from coffee waste

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As the coffee industry grows, the amount of coffee waste discarded each year increases. Most coffee wastes are landfilled or incinerated, and soils are contaminated by caffeine in coffee waste, and animals suffer. Coffee waste-derived carbon dots (C-CDs) that emit blue light were synthesized herein. The synthesized C-CDs was characterized using X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), and Fourier-transform infrared (FT-IR) and it was conformed visually using a Field-emission transmission electron microscopy (FE-TEM). In addition, optical properties were measured by Ultraviolet-visible (UV-Vis) and Photoluminescence (PL). The synthesized C-CDs have a round shape with sizes of ~3.7 nm. The C-CDs showed promising applications as Fe³⁺ sensors in aqueous solutions. The C-CDs exhibited strong turn-off fluorescence when trace Fe³⁺ was added to the solution. The fluorescence response exhibited a good linear relationship with linear range of concentrations between 0-100 M, with a limit of detection (LOD) and limit of quantification (LOQ) value of around 4.314 and 13.074 M for Fe³⁺, respectively.