

A urea precursor to synthesize carbon nitride with mesoporosity for enhanced activity in the photocatalytic removal of phenol

Abstract

A urea precursor was used for the first time to prepare mesoporous carbon nitride (MCN) by a thermal polymerization process with silica nanospheres as a hard template. Although the prepared MCN samples have similar structures and optical properties, it was revealed that the specific surface area, pore-size distribution, and morphology of the MCN samples depend on the initial mass ratio of urea to silica. Compared to the bulk carbon nitride (BCN) that only gave 20% phenol removal (6 h of irradiation), the activities can be enhanced up to 74% on MCN samples for photocatalytic removal of phenol under visible-light irradiation. The highest conversion was obtained on MCN with an initial mass ratio of urea to silica of 5, which has high surface area of 191 m²g⁻¹ and a nanoporous structure with uniform pore-size distribution of 7 nm. In addition to the high activity, the MCN sample also showed high photocatalytic stability.