

[n]-oligourea-based green sorbents with enhanced CO₂ sorption capacity

Abstract

A new series of [n]-oligoureas ([n]-OUs, n=4, 7, 10, and 12) green solid sorbents was prepared following a base-catalyzed, microwave-assisted oligomerization reaction. The materials were characterized by NMR and IR spectroscopy, elemental analysis, thermogravimetric analysis, differential scanning calorimetry, and XRD. Decomposition temperatures at 50 % weight loss (Td50) were ca. 350 °C for all oligomers. Urea and urethane functional groups indicated by IR spectroscopy confirmed the formation of the sorbent. The CO₂ capturing capacities were determined at 35 °C and 1.0 bar (gravimetric method). Accordingly, [10]-OU had the highest CO₂ sorption capacity among the others (18.90 and 22.70 mg CO₂ g sorbent⁻¹) at two different activation temperatures (60 or 100 °C, respectively). Chemisorption was the principal mechanism for CO₂ capture. Cyclic CO₂ sorption/desorption measurements were carried out to test the recyclability of [10]-OU. Activating the sample at 60 °C, three stable CO₂ sorption cycles were achieved after running the first cycle. © 2015 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.