Nicotine-derived ammonium salts as highly efficient catalysts for chemical fixation of carbon dioxide into cyclic carbonates under solvent-free conditions

Abdol R. Hajipour a, b, 1, Yasaman Heidari a, Gholamreza Kozehgary c

a Pharmaceutical Research Laboratory, Department of Chemistry, Isfahan University of Technology, Isfahan 84156, Iran
b Department of Pharmacology, University of Wisconsin, Medical School, 1300 University Avenue, Madison, 53706-1532 WI, USA
c Department of Chemistry, Faculty of Science, Shahid Beheshti University, G. C., Evin, Tehran 1983963113, Iran

Supporting information

Thermal behaviors of ammonium salts

Thermal behaviors of mono and dibenzyl nicotinum bromide were investigated by TGA and DSC (Fig. S1). The decomposition of the mono and di benzylnicotinum bromide occurred in a single stage on temperature range of 200-350°C and 190-350°C respectively, indicating the stability of these compounds at all of the employed reaction temperatures (100 and 120°C). DSC curves of [MBNT]Br and [DBNT]Br show an endothermic peak which centered at around 227°C for [MBNT]Br and 215°C for [DBNT]Br 2 may correspond to melting points of these compounds with enthalpy (ΔH) of 332.5 J/g and 199.8 J/g, respectively. Therefore, the thermal analysis showed that the smallest compounds started to decompose before or during melting.

1 Corresponding author. Tel.: +98 313 391 3262; fax: +98 313 391 2350.
E-mail address: haji@cc.iut.ac.ir; arhajipour@wisc.edu
Cycloaddition products:

4-Chloromethyl-1, 3-dioxolan-2-one (Table 2, entry 1)

IR (KBr): ν 1801 (C=O); $^1$H NMR (CDCl$_3$, 250 MHz, δ, ppm): 3.69-3.79 (m, 2H), 4.41 (dd, $J = 10, 5.0$ Hz, 1H), 4.60 (t, $^3$J (H, H) = 8.7 Hz, 1H), 4.96-5.01 (m, 1H); $^{13}$C NMR (CDCl$_3$, δ, ppm): 44.18, 67.03, 74.55, 154.47; MS (EI): m/z 137 (M$^+$).

4-hexyl-1, 3-dioxolan-2-one (Table 2, entry 2)

IR (KBr) ν 1800 (C=O); $^1$H NMR (CDCl$_3$, 250 MHz, δ, ppm): 0.86-0.91 (m, 3H), 1.29-1.50 (m, 8H), 1.63-1.82 (m, 2H), 4.07 (t, $^3$J (H, H) = 8.7 Hz, 1H), 4.53 (t, $^3$J= 8.7 Hz, 1H), 4.65-4.76 (m, 1H); $^{13}$C NMR (CDCl$_3$, δ, ppm): 13.96, 22.44, 24.30, 28.77, 31.50, 33.78, 69.48, 77.20, 154.91; MS (EI): m/z 172 (M$^+$).
4-phenyl-1, 3-dioxolan-2-one (Table 2, entry 3)

Mp: 52-53.5°C, IR (KBr):  v 1814 (C=O); ¹H NMR (CDCl₃, 250 MHz, δ, ppm): 4.36 (t, ³J = 8.7 Hz, 1H), 4.82 (t, ³J = 8.7 Hz), 5.69 (t, ³J = 8.7 Hz, 1H), 7.28-7.46 (m, 5H). ¹³C NMR (CDCl₃, δ, ppm): 71.3, 78.1, 126, 126.6, 129.3, 129.8, 135.9, 155. MS (EI): m/z 164 (M⁺).

Hexahydro-benzo[1,3]dioxol-2-one. (Table 2, entry 4)

IR (KBr) v 1801 (C=O); ¹H NMR (CDCl₃, 250 MHz, δ, ppm): 1.42-1.46 (m, 2H), 1.57-1.65 (m, 2H), 1.90-1.92(m, 4H), 4.66-4.71(m, 2H); ¹³C NMR (CDCl₃, δ, ppm): 19.17, 26.79, 75.77, 155.4; MS (EI): m/z 142(M⁺).

4-Methyl-1,3-dioxolan-2-one (Table 2, entry 6)

IR (KBr) v 1790 (C=O); ¹H NMR (CDCl₃, 250 MHz, δ, ppm) 1.49 (m, 3 H), 4.02 (dd, J = 7.0, 8.5 Hz, 1 H), 4.55 (dd, J = 7.0, 8.5 Hz, 1 H), 4.83–4.87 (m, 1 H); ¹³C NMR (CDCl₃, δ, ppm) 19.2, 70.5, 73.4, 154.9.

References

