The Role Ionic Liquid [BMIM][PF$_6$] in One-Pot Synthesis of Tetrahydropyran Rings through Tandem Barbier–Prins Reaction

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4-bromo-tetrahydro-2,6-diphenyl-2H-pyran (4b): $^1$H NMR (200 MHz, CDCl$_3$) $\delta = 7.35$ (m, 10H, 10H aromatic), 4.57 (d, $J = 12$ Hz, 2H, H$_2$ ax e H$_6$ ax), 4.44 (m, 1H, H$_4$ ax), 2.56 (m, 2H, H$_3$ ax e H$_5$ ax), 2.13 (m, 2H, H$_3$ eq e H$_5$ eq). $^{13}$C NMR (50 MHz, CDCl$_3$) $\delta = 145.13$, 132.63, 131.68, 129.70, 83.66, 50.08, 49.03.

Espectro S1 - Espectro de RMN $^1$H (CDCl$_3$, 200 MHz) do 4-bromo-tetrahydro-2,6-diphenyl-2H-pyran (4b)
Espectro S2 - Espectro de ${}^{13}$C RMN (CDCl$_3$, 50 MHz) do 4-bromo-tetrahydro-2,6-diphenyl-2H-pyran (4b)
4-bromo-2,6-bis(4-fluorophenyl)-tetrahydro-2H-pyran (5b): $^1$H NMR (500 MHz, CDCl$_3$) $\delta = 7.38$ (m, 4H, 4H aromatic), 7.06 (m, 4H, 4H aromatic), 4.55 (m, J 10.0, 2H, H$_2$ ax e H$_6$ ax), 4.41 (m, 1H, H$_4$ ax), 2.55 (m, 2H, H$_3$ ax e H$_5$ ax), 2.09 (m, 2H, H$_3$ eq e H$_5$ eq); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta = 158.55$, 156.59, 122.79, 122.72, 110.68, 110.51, 74.44, 40.76, 40.25.
Espectro S4 - Espectro de RMN $^{13}$C (CDCl$_3$, 125 MHz) do 4-bromo-2,6-bis(4-fluorofenil)-tetrahydro-2H-pyran (5b)
4-bromo-2,6-bis(4-chlorophenyl)-tetrahydro-2H-pyran (6b): $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ = 7.34 (m, 8H, 8H aromatic), 4.54 (dd, J = 10.0, 8.0, H$_2$ ax e H$_6$ ax), 4.42 (m, 1H, H$_4$ ax), 2.54 (m, 1H, H$_3$ ax e H$_5$ ax), 2.06 (m, 1H, H$_3$ eq e H$_5$ eq); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$ = 139.47, 133.59, 128.66, 127.14, 79.06, 45.27, 44.81.
EspectroS6 - Espectro de RMN $^{13}$C (CDCl$_3$, 125 MHz) do 4-bromo-2,6-bis(4-chlorophenyl)-tetrahydro-2H-pyran (6b)
4-bromo-tetrahydro-2,6-dip-tolyl-2H-pyran (7b): $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ = 7.31 (m, 8H, aromatic), 4.54 (dd, $J$ = 10.0 Hz, 2H, $H_2$ ax e $H_6$ ax), 4.45 (m, 1H, $H_4$ ax), 2.55 (m, 1H, $H_3$ ax e $H_5$ ax), 2.36 (s, 6H), 2.12 (m, 3H, $H_3$ eq e $H_5$ eq); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$ = 133.48, 132.51, 124.16, 120.99, 74.73, 41.55, 40.23, 16.25.

Especro S7 - Espectro de RMN $^1$H (CDCl$_3$, 500 MHz) do 4-bromo-tetrahydro-2,6-dip-tolyl-2H-pyran (7b)
Espectro S8 - Espectro de RMN $^{13}$C (CDCl$_3$, 125 MHz) do 4-bromo-tetrahydro-2,6-dip-tolyl-2H-pyran (7b)
4-bromo-tetrahydro-2,6-bis(4-nitrophenyl)-2H-pyran (8b): $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ = 8.28 (m, 4H, 4H aromatic), 7.63 (m, 4H, 4H aromatic), 4.75 (dd, J = 10.0, 2H, H$_2$ ax e H$_6$ ax), 4.49 (m, 1H, H$_4$ ax), 2.66 (m, 2H, H$_3$ eq e H$_5$ eq), 2.12 (m, 2H, H$_3$ eq e H$_5$ eq); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$ = 147.55, 126.44, 126.44, 123.87, 78.72, 44.36, 43.96.

Espectro S9 - Espectro de RMN $^1$H (CDCl$_3$, 500 MHz) do 4-bromo-tetrahydro-2,6-bis(4-nitrophenyl)-2H-pyran (8b)
Espectro S10 - Espectro de RMN $^{13}$C (CDCl$_3$, 125 MHz) do 4-bromo-tetrahydro-2,6-bis(4-nitrofenol)-2H-piran (8b)
4-bromo-tetrahydro-2,6-diheptyltetrahydropyran (9b): $^1$H NMR (500 MHz, CDCl$_3$): δ = 4.12 (m, H$_4$ ax), 3.21 (m, H$_2$ ax e H$_6$ ax), 2.19 (dd, J = 10.0 Hz, H$_3$ eq e H$_5$ eq), 1.61 (m, H$_3$ ax e H$_5$ ax), 1.519 (m, 24H, (CH$_2$)$_6$), 0.829 (t, 6H, CH$_3$). $^{13}$C NMR (125 MHz, CDCl$_3$): δ= 47.33, 43.43, 35.74, 31.65, 29.03, 25.34, 22.45, 13.94.

Espectro S11 - Espectro de RMN $^1$H (CDCl$_3$, 500 MHz) do 4-bromo-2,6-diheptyl-tetrahydro-2H-pyran (9b)
Espectro S12 - Espectro 10 - Espectro de RMN $^{13}$C (CDCl$_3$, 125 MHz) do 4-bromo-2,6-dieptyl-tetrahydro-2H-pyran (9b)