Supporting Information

A greener procedure for the synthesis of α-ureidophosphonates under ultrasound irradiation. X-ray crystallographic study

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1H NMR spectrum: Diethyl [α-ureido-(phenyl)]methylphosphonate

13C NMR spectrum: Diethyl [α-ureido-(phenyl)]methylphosphonate

31P NMR spectrum: Diethyl [α-ureido-(phenyl)]methylphosphonate

IR spectrum: Diethyl [α-ureido-(phenyl)]methylphosphonate

1H NMR spectrum: Diethyl [α-ureido-(4-methylphenyl)]methylphosphonate

31P NMR spectrum: Diethyl [α-ureido-(4-methylphenyl)]methylphosphonate

IR spectrum: Diethyl [α-ureido-(4-methylphenyl)]methylphosphonate

MS: Diethyl [α-ureido-(4-methylphenyl)]methylphosphonate

1H NMR spectrum: Diethyl [α-ureido-(2-chlorophenyl)]methylphosphonate

31P NMR spectrum: Diethyl [α-ureido-(2-chlorophenyl)]methylphosphonate

IR spectrum: Diethyl [α-ureido-(2-chlorophenyl)]methylphosphonate

MS: Diethyl [α-ureido-(2-chlorophenyl)]methylphosphonate

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1H NMR spectrum: Diethyl [α-ureido-(4-bromophenyl)]methylphosphonate

13C NMR spectrum: Diethyl [α-ureido-(4-bromophenyl)]methylphosphonate

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13C NMR spectrum: Diethyl [α-ureido-(4-chlorophenyl)]methylphosphonate

31P NMR spectrum: Diethyl [α-ureido-(4-chlorophenyl)]methylphosphonate

IR spectrum: Diethyl [α-ureido-(4-chlorophenyl)]methylphosphonate
1. General data

All chemicals and solvents were purchased from common commercial sources and were used as received without any further purification. All reactions were monitored by TLC on silica Merck 60 F_{254} percolated aluminum plates and were developed by spraying with ninhydrin solution. Column chromatography was performed with Merck silica gel (230-400 mesh). Proton nuclear magnetic resonance (¹H NMR) spectra were recorded on a Brücker or Jeol spectrometer at 250, or 400 MHz. Chemical shifts is reported in δ units (ppm) with TMS as reference (δ 0.00). All coupling constants (J) are reported in Hertz. Multiplicity is indicated by one or more of the following: s (singlet), d (doublet), t (triplet), q (quartet), m (multiplet). Carbon nuclear magnetic resonance (¹³C NMR) spectra were recorded on a Brücker or Jeol at 60, 75 or 100 MHz. Chemical shifts are reported in δ units (ppm) relative to CDCl₃ (δ 77.0). Phosphorus nuclear magnetic resonance (³¹P NMR) spectra were recorded on a Brücker or Jeol at 75, 100 or 161 MHz. Infrared spectra were recorded on a Perkin Elmer 600 spectrometer. Elemental analysis was recorded on a EURO E.A 3700. Melting points were recorded on a Büchi B-545 apparatus in open capillary tubes. Ultrasound assisted reactions were carried out using a FUNGILAB ultrasonic bath with a frequency of 40 kHz and a nominal power of 250 W. The reactions were carried out in an open glass tube (diameter: 25 mm; thickness: 1 mm; volume: 20 mL) at 75°.

2. Crystallography

A single crystal of the studied compound, 13b, C_{15}H_{24}N_{2}O_{4}P, with dimensions of 0.06×0.11×0.13 mm³, was selected for single crystal X-ray diffraction analysis. Data collection was performed, at 295(2)K, on a Bruker APEX II diffractometer, CCD area detector equipped with a graphite monochromatizedMoKα radiation (λ= 0.71073 Å). Crystallographic data for 13b: C_{15}H_{24}N_{2}O_{4}P, M = 327.33, T = 295(2) K, monoclinic, space group P2₁/n (no. 14), a = 9.6789(5), b = 9.1089(4), c = 20.6717(9) Å, β=93.303(2)°, V = 1819.48(15) Å³, Z = 4, Dc =
1.195 Mg m\(^{-3}\), \(\mu= 0.169\) mm\(^{-1}\), independent reflections = 3602 [Rint = 0.0379], R1 [for 2291 reflections with I > 2r(I)] = 0.0675, wR2 (all data = 0.1907).

3. Typical experimental procedure for the synthesis of \(\alpha\)-ureidophosphonates

In a glass tube (diameter: 25 mm; thickness: 1 mm; volume: 20 mL) take a mixture of aldehyde (1 mmol) and urea (1 mmol) at 75\(^{\circ}\)C, (1 mmol) triethylphosphite was added. The reaction mixture was subjected to the ultrasonication with a frequency of 40 kHz for appropriate time. After completion of the reaction, as indicated by TLC, silica gel; dichloromethane:methanol (9:1), a (6:4) mixture of diethyl ether and n-hexane was added to the reaction mixture and pure product was crystallized to 6\(^{\circ}\)C overnight. The product was finally filtered and dried.

\[
\begin{align*}
\text{H}_2\text{N} & \text{NH}_2 + \text{R} - \text{OP(OEt)}_3 \\
\rightarrow \text{R} - \text{NH}_2 \text{OH}
\end{align*}
\]

\(X=\text{O and S}\)  
\(R=\text{Aryl, Alkyl}\)

Scheme 1 Synthesis of \(\alpha\)-ureidophosphonates under ultrasound irradiation.

\[
\begin{align*}
\text{H}_2\text{N} & \text{NH}_2 + \text{R} - \text{OP(OEt)}_3 \\
\rightarrow \text{R} - \text{OP(OEt)}_3
\end{align*}
\]

\(X=\text{O and S}\)  
\(R=\text{Aryl and Alkyl}\)

Scheme 2 Mechanistic proposal for the synthesis of \(\alpha\)-ureidophosphonates.
4. Spectral data

\[
\begin{array}{c}
\text{Diethyl [α-ureido-(phenyl)methylphosphonate (Table 2, Entry 1b)]}
\end{array}
\]

White solid. Yield 85 %. M.p. 197-199 °C. \(R_f = 0.41\) (CH\(_2\)Cl\(_2\)/MeOH:95/05). \(\nu_{\text{max}}\) (KBr/cm\(^{-1}\)) 3433.35, 3315.6, 3224.56, 1686.37, 1235.85, 1023.65 (120 MHz, CDCl\(_3\)) 21.61 ppm. \(\delta\) (400 MHz, CDCl\(_3\)) 1.03 (t, \(J = 7.20\) Hz, 3H, CH\(_3\)-O), 1.29 (t, \(J = 6.89\) Hz, 3H, CH\(_3\)-O), 3.60-3.64 (m, 1H, CH\(_2\)-O), 3.85-3.89 (m, 1H, CH\(_2\)-O), 4.06-4.17 (m, 2H, CH\(_2\)), 5.14 (s, 2H, NH), 5.17-5.21 (dd, \(J_1 = 18.00, J_2 = 17.45\) Hz, 1H, CH*), 7.12-7.23 (m, 5H, H-Ar), 7.26 (s, 1H, NH) ppm. \(\delta\) (100 MHz, CDCl\(_3\)) 16.32, 16.59, 54.05, 63.96, 64.11, 124.46, 126.31, 126.36, 126.75, 126.9, 134.24, 159.05 ppm. Ms (m/z): 287 (M+1). Anal. Calc. for C\(_{12}\)H\(_{19}\)N\(_2\)O\(_4\)P: C, 50.35; H, 6.69; N, 9.79. Found: C, 50.30; H, 6.73; N, 9.85.

\[
\begin{array}{c}
\text{Diethyl [α-ureido-(4-methylphenyl)methylphosphonate (Table 2, Entry 2b)]}
\end{array}
\]

White solid. Yield 78 %. M.p. 184-186 °C. \(R_f = 0.43\) (CH\(_2\)Cl\(_2\)/MeOH:95/05). \(\nu_{\text{max}}\) (KBr/cm\(^{-1}\)) 3433.33, 3315.93, 3264.5, 1666.37, 1235.85. \(\delta\) (120 MHz, CDCl\(_3\)) 20.61 ppm. \(\delta\) (250 MHz, CDCl\(_3\)) 1.08 (t, \(J = 7.12\) Hz, 3H, CH\(_3\)-CH\(_2\)-O), 1.32 (t, \(J = 6.94\) Hz, 3H, CH\(_3\)-CH\(_2\)-O), 2.38 (s, 3H, CH\(_3\)-CAr), 3.68-3.72 (m, 1H, CH\(_2\)-O), 3.81-3.85 (m, 1H, CH\(_2\)-O), 4.27-4.32 (m, 2H, CH\(_2\)-O), 5.25 (s, 2H, NH), 5.31-5.45 (dd, \(J_1 = 9.80, J_2 = 21.66\) Hz, 1H, CH*), 7.10-7.4 (m, 4H, H-Ar), 7.56 (s, 1H, NH) ppm. \(\delta\) (100 MHz, CDCl\(_3\)) 16.68, 16.87, 24.2, 53.5, 63.45, 64.54, 124.7, 126.2, 132.4, 135.45, 135.95, 136.1, 160.4 ppm. Ms (m/z): 301.2 (M+1). Anal. Calc. for C\(_{13}\)H\(_{21}\)N\(_2\)O\(_4\)P: C, 52.00; H, 6.69; N, 9.79. Found: C, 52.05; H, 6.73; N, 9.85.

\[
\begin{array}{c}
\text{Diethyl [α-ureido-(2-chlorophenyl)methylphosphonate (Table 2, Entry 3b)]}
\end{array}
\]

Color solid. Yield 83 %. M.p. 202-204 °C. \(R_f = 0.42\) (CH\(_2\)Cl\(_2\)/MeOH:95/05). \(\nu_{\text{max}}\) (KBr/cm\(^{-1}\)) 3424.31, 3323.21, 3203.28, 1687.51, 1220.90. \(\delta\) (120 MHz, CDCl\(_3\)) 22.24 ppm. \(\delta\) (250 MHz, CDCl\(_3\)) 1.04 (t, \(J = 7.20\) Hz, 3H, CH\(_3\)-CH\(_2\)-O), 1.36 (t, \(J = 7.20\) Hz, 3H, CH\(_3\)-CH\(_2\)-O), 3.70-3.75 (m, 1H, CH\(_2\)-O), 3.80-3.90 (m, 1H, CH\(_2\)-O), 4.20-4.30 (m, 2H, CH\(_2\)-O), 5.21 (s, 2H, NH), 5.59 (dd, \(J_1 = 9.60, J_2 = 22.00\) Hz, 1H, CH*), 7.31-7.54 (m, 4H, H-Ar), 7.60 (s, 1H, NH).
ppm. $\delta_C (100 \text{ MHz, } \text{CDCl}_3) 16.12, 16.51, 46.79, 48.15, 63.76, 64.01, 127.22, 129.22, 129.55, 133.97, 134.05, 134.58, 158.32 \text{ ppm.}$

$\text{Ms (m/z): 321.1 (M+1). Anal. Calc. for } C_{12}H_{16}ClN_2O_4P: C, 44.94; H, 5.66; N, 11.05. \text{ Found: C, 45.02; H, 5.61; N, 11.01.}$

Diethyl $[\alpha$-ureido-(4-fluorophenyl)]methylphosphonate (Table 2, Entry 5b)

White solid. Yield 81 %. M.p. 198-200 °C. $R_f = 0.40$ (CH$_2$Cl$_2$/MeOH:95/05). $\nu_{\text{max}} (\text{KBr/cm}^{-1}) 3447.46, 3330.45, 3259.60, 1689.16, 1238.12. \delta_C (100 \text{ MHz, } \text{CDCl}_3) 23.12 \text{ ppm.}$ $\delta_H (250 \text{ MHz, } \text{CDCl}_3) 1.04 \text{ (t, } J = 7.11 \text{ Hz, } 3H, \text{ CH}_3-\text{CH}_2O), 1.38 \text{ (t, } J = 6.92 \text{ Hz, } 3H, \text{ CH}_3-\text{CH}_2O), 3.67-3.70 \text{ (m, } 1H, \text{ CH}_2-O), 3.87-3.90 \text{ (m, } 1H, \text{ CH}_2-O), 4.21-4.25 \text{ (m, } 2H, \text{ CH}_2-O), 5.19 \text{ (s, } 2H, \text{ NH}), 5.31-5.48 \text{ (dd, } J_1 = 9.96, J_2 = 21.81, \text{ Hz, } 1H, \text{ CH*}), 7.21-7.48 \text{ (m, } 4H, \text{ H-Ar}), 7.54 \text{ (s, } 1H, \text{ NH}) \text{ ppm.}$

$\text{Ms (m/z): 305 (M+1). Anal. Calc. for } C_{12}H_{18}FN_2O_4P: C, 47.37; H, 5.96; N, 9.21. \text{ Found: C, 47.29; H, 5.92; N, 9.26.}$

Diethyl $[\alpha$-ureido-(4-bromophenyl)]methylphosphonate (Table 2, Entry 7b)

White solid. Yield 79 %. M.p. 188-190 °C. $R_f = 0.40$ (CH$_2$Cl$_2$/MeOH:95/05). $\nu_{\text{max}} (\text{KBr/cm}^{-1}) 3446.50, 3218.4, 3213.02, 1660.49, 1559.08, 1238.02. \delta_C (120 \text{ MHz, } \text{CDCl}_3) 21.23 \text{ ppm.}$ $\delta_H (250 \text{ MHz, } \text{CDCl}_3) 1.14 \text{ (t, } J = 6.94 \text{ Hz, } 3H, \text{ CH}_3-\text{CH}_2O), 1.41 \text{ (t, } J = 6.87 \text{ Hz, } 3H, \text{ CH}_3-\text{CH}_2O), 3.76-3.81 \text{ (m, } 1H, \text{ CH}_2-O), 3.88-3.92 \text{ (m, } 1H, \text{ CH}_2-O), 3.99-4.27 \text{ (m, } 2H, \text{ CH}_2-O), 5.21 \text{ (s, } 2H, \text{ NH}), 5.25-5.48 \text{ (dd, } J_1 = 9.89, J_2 = 22.03, \text{ Hz, } 1H, \text{ CH*}), 7.21-7.52 \text{ (m, } 4H, \text{ H-Ar}), 7.6 \text{ (s, } 1H, \text{ NH}) \text{ ppm.}$ $\delta_C (120 \text{ MHz, } \text{CDCl}_3) 16.20, 16.42, 54.26, 64.02, 64.13, 126.24, 126.76, 130.27, 130.36, 134.00, 151.04, 160.04 \text{ ppm.}$

$\text{Ms (m/z): 366 (M+1). Anal. Calc. for } C_{12}H_{18}BrN_2O_4P: C, 39.56; H, 4.94; N, 7.69. \text{ Found: C, 39.48; H, 4.88; N, 7.57.}$

Diethyl $[\alpha$-ureido-(4-nitrophenyl)]methylphosphonate (Table 2, Entry 8b)

White solid. Yield 85 %. M.p. 203-205 °C. $R_f = 0.45$ (CH$_2$Cl$_2$/MeOH:95/05). $\nu_{\text{max}} (\text{KBr/cm}^{-1}) 3433.35, 3315.6, 3224.56, 1666, 1242, 1023 \text{ cm}$. $\delta_C (120 \text{ MHz, } \text{CDCl}_3) 1.03 \text{ (t, } J = 7.20 \text{ Hz, } 3H, \text{ CH}_3-\text{CH}_2O), 1.31 \text{ (t, } J = 6.89 \text{ Hz, } 3H, \text{ CH}_3-\text{CH}_2O), 3.60-$
3.64 (m, 1H, CH₂-O), 3.85-3.91 (m, 1H, CH₂-O), 4.11-4.17 (m, 2H, CH₂-O), 5.14 (s, 2H, NH), 5.17-5.21 (dd, J₁ 9.25, J₂ 21.75 Hz, 1H, CH*), 7.12-7.23 (m, 5H, H-Ar), 7.26 (s, 1H, NH) ppm. δC (100 MHz, CDCl₃) 16.32, 16.41, 55.42, 63.14, 63.33, 127.06, 126.31, 126.36, 128.55, 136.58, 136.58, 161.68 ppm. Ms (m/z): 332 (M+1). Anal. Calc. for C₁₂H₁₉N₂O₄P: C, 50.35; H, 6.69; N, 9.79. Found: C, 50.21; H, 6.73; N, 9.78.

Diethyl [α-ureido-(4-chlorophenyl)methyl phosphonate (Table 2, Entry 8b)]
White solid. Yield 80 %. M.p. 201-203 °C. Rf = 0.42 (CH₂Cl₂/MeOH:95/05). νmax (KBr/cm⁻¹) 3436.17, 3321.12, 3262.15, 1689.49, 1239.69. δH (400 MHz, CDCl₃) 1.10 (t, J 7.03 Hz, 3H, CH₃-CH₂), 1.34 (t, J 7.06 Hz, 3H, CH₃-CH₂), 3.69-3.73 (m, 1H, CH₂-O), 3.85-3.99 (m, 1H, CH₂-O), 4.08-4.15 (m, 2H, CH₂-O), 5.26 (s, 2H, NH), 5.31-5.36 (dd, J₁ 9.40, J₂ 20.10 Hz, 1H, CH*), 7.25-7.34 (m, 4H, H-Ar), 7.55 (s, 1H, NH) ppm. δC (100 MHz, CDCl₃) 16.24, 16.51, 53.14, 53.91, 63.59, 63.89, 128.77, 129.42, 129.48, 134.70, 158.58 ppm. Ms (m/z): 321 (M+1). Anal. Calc. for C₁₂H₁₈ClN₂O₄P: C, 44.94; H, 5.66; N, 11.05. Found: C, 45.02; H, 5.61; N, 11.01.

Diethyl [α-ureido-(4-dimethylaminophenyl)methylphosphonate (Table 2, Entry 11b)]
Yellow solid. Yield 85%. M.p. 192-194 °C. Rf = 0.47 (CH₂Cl₂/MeOH:95/05). νmax (KBr/cm⁻¹) 3424.31, 3323.21, 3203.26, 1687.51, 1220.90, 1017.76. δH (CDCl₃) 1.13 (t, 3H, J 7.22 Hz, CH₃-N), 1.39 (t, 3H, J 7.12 Hz, CH₃-CH₂-O), 2.93 (s, 6H, 2CH₃-N), 3.74-3.83 (m, 1H, CH₂-O), 3.88-3.97 (m, 1H, CH₂-O), 4.15-4.30 (m, 2H, CH₂-O), 5.18 (s, 2H, NH), 5.32 (dd, 1H, J₁ 9.96, J₂ 21.11 Hz, CH*), 7.34-7.45 (m, 4H, H-Ar), 7.50 (s, 1H, NH) ppm. δC (CDCl₃) 159.25 ppm. Ms (m/z): 329.7 (M+1). Anal. Calc. for C₁₄H₂₄N₃O₄P: C, 51.06; H, 7.35; N, 12.76. Found: C, 51.11; H, 7.37, N, 12.75.

Diethyl [α-ureido-(4-isopropylphenyl)methylphosphonate (Table 2, Entry 13b)]
Cristal. Yield 85%. M.p. 197-199 °C. Rf = 0.46 (CH$_2$Cl$_2$/MeOH:95/05). v$_{\text{max}}$(KBr/cm$^{-1}$) 3443.17, 3362.23, 3252.64, 1664, 1238.02, 1028.42. δ$_p$(CDCl$_3$) 21.48 ppm. δ$_H$(CDCl$_3$, 250 MHz) 1.09 (2d, 6H, J 7.05 Hz, 2CH$_3$-CH), 1.11 (t, 3H, J 7.04 Hz, CH$_3$-CH$_2$O), 1.31 (t, 3H, J 7.11 Hz, CH$_3$-CH$_2$O), 2.89 (m, 1H, CH-Ar), 3.71-3.79 (m, 1H, CH$_2$-O), 3.84-3.91 (m, 1H, CH$_2$-O), 4.11-4.24 (m, 2H, CH$_2$-O), 5.18 (s, 2H, NH), 5.32 (dd, 1H, J$_1$ 9.91, J$_2$ 19.75 Hz, CH), 7.19-7.49 (m, 4H, H-Ar), 7.51 (s, 1H, NH), ppm. δ$_C$(CDCl$_3$, 100 MHz) 16.8, 16.9, 21.15, 23.14, 34.5, 53.4, 63.5, 64.5, 124.12, 124.56, 127.8, 131.2, 132.3, 139.1, 160.1 ppm. Ms (m/z): 328.7 (M$^+$).

Anal. Calcd for C$_{15}$H$_{25}$N$_2$O$_4$P: C, 54.87; H, 7.67; N, 5.53. Found: C, 54.81; H, 7.70; N, 5.56.

Diethyl [α-ureido-(4-methoxyphenyl)] methyl phosphonate (Table 2, Entry 15b)

Wide solid. Yield 78 %. M.p. 204-206 °C. Rf = 0.46 (CH$_2$Cl$_2$/MeOH:95/05). v$_{\text{max}}$(KBr/cm$^{-1}$) 3446.58, 3314.26, 3213.02, 1660.49, 1238.02, 1084.15. δ$_p$(CDCl$_3$) 21.15 ppm. δ$_H$(CDCl$_3$, 250 MHz) 1.18 (t, J 7.20 Hz, 3H, CH$_3$-CH$_2$O), 1.35 (t, J 7.00 Hz, 3H, CH$_3$-CH$_2$O), 3.76-3.86 (m, 1H, CH$_2$-O), 3.91-3.96 (m, 1H, CH$_2$-O), 3.97-4.10 (m, 2H, CH$_2$-O), 5.14 (s, 2H, NH$_2$), 5.28 (dd, J$_1$ 9.21, J$_2$ 22.40 Hz, 1H, CH*), 7.10 (dd, J 9.6 Hz, 1H, NH), 7.31 (d, J 8.2 Hz, 2H, H-Ar), ppm. δ$_C$(CDCl$_3$, 100 MHz) 16.7, 16.9, 52.5, 53.4, 63.9, 64.7, 123.6, 129.7, 129.9, 131.8, 131.8, 136.5, 159.95 ppm. Ms (m/z): 317.1 (M$^+$). Anal. Calcd for C$_{13}$H$_{23}$N$_2$O$_5$P: C, 49.37; H, 6.69; N, 8.86. Found: C, 49.41; H, 6.67; N, 8.84.
$^1$H NMR spectrum: Diethyl [α-ureido-(phenyl)]methyl phosphonate

$^{13}$C NMR spectrum: Diethyl [α-ureido-(phenyl)]methyl phosphonate
$^3$P NMR spectrum: Diethyl [$\alpha$-ureido-(phenyl)]methyl phosphonate

IR spectrum: Diethyl [$\alpha$-ureido-(phenyl)]methyl phosphonate
$^{1}H$ NMR spectrum: Diethyl [α-ureido-(4-methylphenyl)]methyl phosphonate

$^{31}P$ NMR spectrum: Diethyl [α-ureido-(4-methylphenyl)]methyl phosphonate
IR spectrum: Diethyl [α-ureido-(4-methylphenyl)]methyl phosphonate

MS: Diethyl [α-ureido-(4-methylphenyl)]methyl phosphonate
$^1$H NMR spectrum: Diethyl [α-ureido-(2-chlorophenyl)]methyl phosphonate

$^{13}$C NMR spectrum: Diethyl [α-ureido-(2-chlorophenyl)]methyl phosphonate
$^{31}$P NMR spectrum: Diethyl [α-ureido-(2-chlorophenyl)]methyl phosphonate

IR spectrum: Diethyl [α-ureido-(2-chlorophenyl)]methyl phosphonate
MS: Diethyl [α-ureido-(2-chlorophenyl)]methyl phosphonate

$^1$H NMR spectrum: Diethyl [α-ureido-(4-fluorophenyl)]methyl phosphonate
$^{13}$C NMR spectrum: Diethyl [α-ureido-(4-fluorophenyl)] methyl phosphonate

$^{31}$P NMR spectrum: Diethyl [α-ureido-(4-fluorophenyl)] methyl phosphonate
IR spectrum: Diethyl [α-ureido-(4-fluorophenyl)] methyl phosphonate

$^1$H NMR spectrum: Diethyl [α-ureido-(4-bromophenyl)] methyl phosphonate
**IR spectrum:** Diethyl [α-ureido-(4-bromophenyl)] methyl phosphonate

**\(^1\)H NMR spectrum:** Diethyl [α-ureido-(4-nitrophenyl)] methyl phosphonate
$^{13}$C NMR spectrum: Diethyl [α-ureido-(4-nitrophenyl)] methyl phosphonate

$^{31}$P NMR spectrum: Diethyl [α-ureido-(4-nitrophenyl)] methyl phosphonate
IR spectrum: Diethyl [α-ureido-(4-nitrophenyl)] methyl phosphonate

$\text{H}^1$ NMR spectrum: Diethyl [α-ureido-(4-chlorophenyl)] methyl phosphonate
$^{13}$C NMR spectrum: Diethyl [α-ureido-(4-chlorophenyl)] methyl phosphonate

IR spectrum: Diethyl [α-ureido-(4-chlorophenyl)] methyl phosphonate
MS: Diethyl [α-ureido-(4-chlorophenyl)] methyl phosphonate

$^1$H RMN: Diethyl [α-ureido-(4-dimethylamino)phenyl)] methyl phosphonate
IR spectrum: Diethyl [α-ureido-(4-dimethylamino)phenyl] methyl phosphonate

MS: Diethyl [α-ureido-(4-dimethylamino)phenyl] methyl phosphonate
IR spectrum: Diethyl [α-ureido-(4-isopropylphenyl)]methyl phosphonate

MS: Diethyl [α-ureido-(4-isopropylphenyl)]methyl phosphonate
IR spectrum: Diethyl [α-ureido-(4-methoxyphenyl)]methyl phosphonate

MS: Diethyl [α-ureido-(4-methoxyphenyl)]methyl phosphonate