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Electronic Supplementary Information

Interfacial Catalysis of Aldol Reactions by Prolinamide Surfactants in Reverse Micelles

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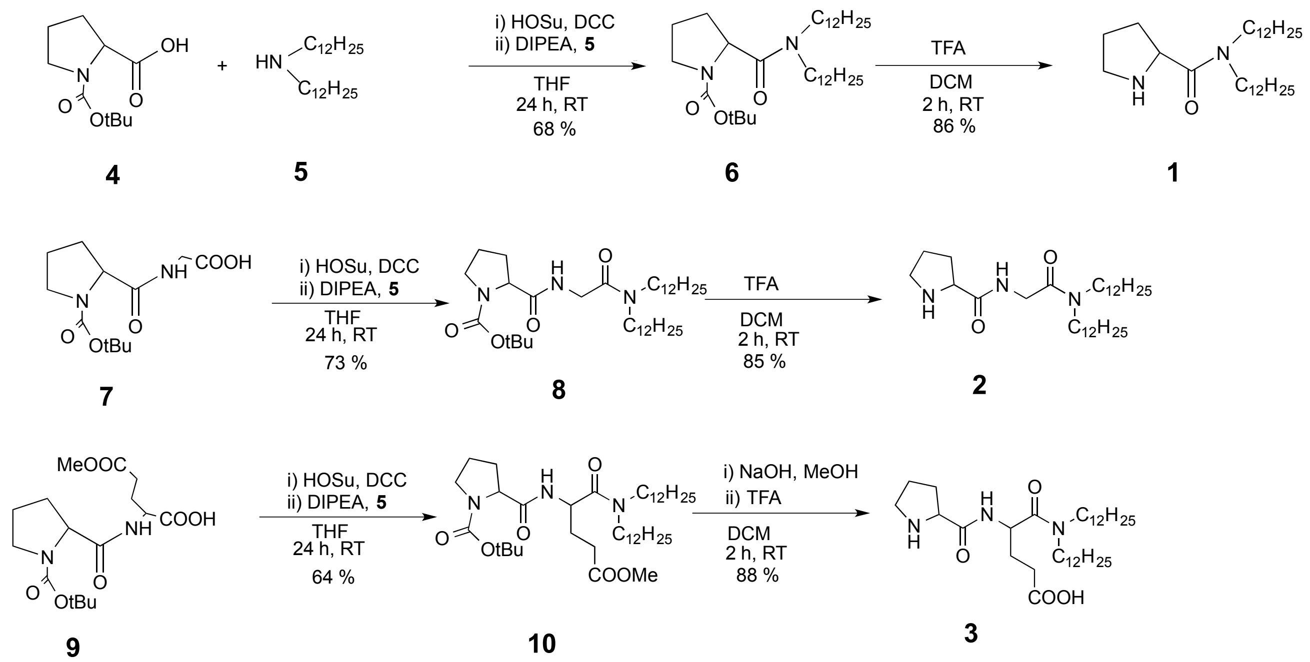
Scheme S1



Syntheses

Syntheses of compounds **7**,[1] and **9**,[2,3] were previously reported.

Compound 1: To a solution of **4** (0.30 g, 1.29 mmol) in tetrahydrofuran (10 mL), dicylcohexylcarbodiimide (0.25 g, 1.25 mmol) and N-hydroxysuccinimide (0.12 g, 1.25 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The solid precipitate was filtered off and didodecylamine (0.3 g, 0.85 mmol) and N,N-diisopropylethylamine (0.5 mL, 3.87 mmol) were added to the filtrate. After the mixture was stirred for another 12 h, the organic solvent was removed by rotary evaporation. The residue was dissolved in a minimum amount of methanol and the solution was poured into 100 mL of water. The solution was neutralized by 2 M HCl, followed by extraction with ethyl acetate (3 × 20 mL). The combined organic layers were washed with brine, dried over sodium sulfate, filtered, and concentrated in vacuo. The residue was purified by column chromatography over silica gel using hexane/EtOAc (1/0 to 20/1) as the eluent to give a ??? (0.36 g, 68 %). The compound was dissolved in a mixture of dichloromethane (10 mL) and trifluoroacetic acid (0.5 mL, 4.6 mmol). After 2 h at room temperature, the reaction mixture was poured into 100 mL of water and neutralized by saturated sodium carbonate, followed by extraction with ethyl acetate (3 × 20 mL). The combined organic layers were washed with brine, dried over sodium sulfate, filtered, and concentrated in vacuo. The residue was purified by column chromatography over silica gel using dichloromethane/MeOH (10/1) as the eluent to give a glassy solid (0.25 g, 86 %). ^{1}H NMR (400 MHz, $CDCl_3$, δ) 4.55-4.47 (m, 1H), 3.55–3.40 (m, 1H), 3.39–3.30 (m, 1H), 3.30–3.10 (m, 4H), 2.42–2.30 (m, 1H), 2.10–1.70 (m, 5H), 1.35–1.17 (m, 39H), 0.88 (t, J = 6.7 Hz, 6H). ^{13}C NMR (101 MHz, $CDCl_3$, δ): 172.0, 77.6, 77.3, 77.0, 57.8, 47.2, 46.0, 31.9, 31.9, 31.1, 29.7, 28.9, 27.5, 27.0,26.9, 26.0, 22.7, 14.1. HRMS (*m/z*): $[M + H]^+$ calcd for $C_{29}H_{59}N_2O$, 451.4622; found, 451.4617.

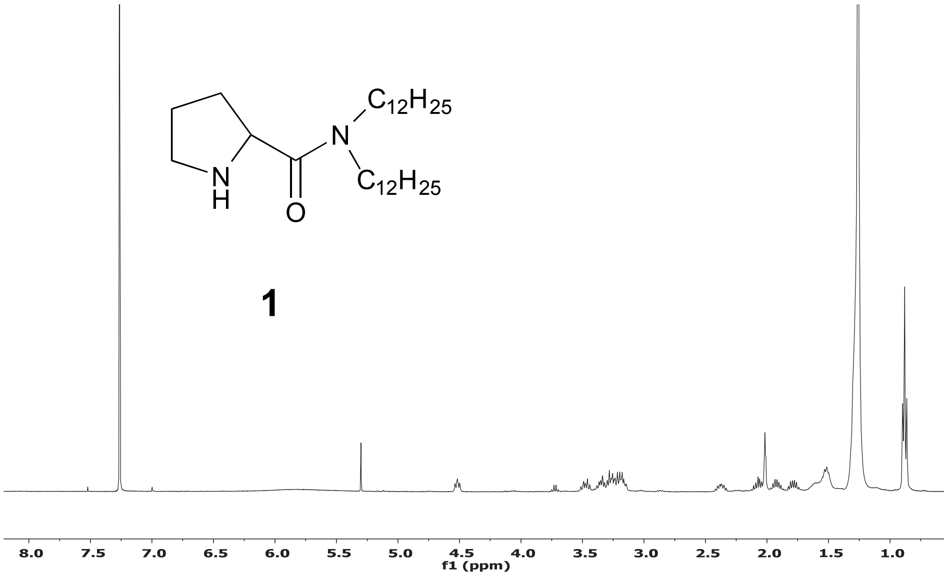
Compound 8: To a solution of **7** (0.40 g, 1.40 mmol) in THF (10 mL), dicylohexylacarbodimide (0.28 g, 1.25 mmol) and N-hydroxysuccinimide (0.12 g, 1.25 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The solid precipitate was filtered off and didodecylamine (0.40 g, 1.13 mmol) and N,N-diisopropylethylamine (0.5 mL, 3.87 mmol) were added to the filtrate. After the mixture was stirred for another 12 h, the organic solvent was removed by rotary evaporation. The residue was dissolved in a minimum amount of methanol and the solution was poured into 100 mL of water. The solution was neutralized by 2 M HCl, followed by extraction with ethyl acetate (3 × 20 mL). The combined organic layers were washed with brine, dried over sodium sulfate, filtered, and concentrated in vacuo. The residue was purified by column chromatography over silica gel using hexane/EtOAc (1/0 to 20/1) as the eluent to give a glassy solid (0.5 g, 73 %). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 4.06 (m, 2H), 3.15 (m, 4H), 2.15 (m, 4H), 1.93 – 1.85 (m, 14H), 1.26 (d, *J* = 3.4 Hz, 39H), 0.88 (t, 6H). ^{13}C NMR (101 MHz, $CDCl_3$, δ): 172.94, 172.35, 167.04, 157.71, 80.17, 77.54, 76.90, 67.92, 61.09, 60.57, 48.81, 47.89, 46.17, 436.63, 33.97, 33.18, 29.76, 28.76, 27.87, 26.99, 25.6, 25.00, 24.4, 17.6, 14.12. HRMS (*m/z*): $[M + H]^+$ calcd for $C_{36}H_{70}N_3O_4$, 608.5361; found, 608.5359.

Compound 2: To a solution of compound **8** (0.5 g, 0.8 mmol) in dichloromethane (10 mL), trifluoroacetic acid (1.7 mL, 16 mmol) was added. After 2 h at room temperature, the reaction mixture was poured into 100 mL of water and neutralized by saturated sodium carbonate, followed by extraction with ethyl acetate (3 × 20 mL). The combined organic layers were washed with brine, dried over sodium sulfate, filtered, and concentrated in vacuo. The residue was purified by column chromatography over silica gel using dichloromethane/methanol (10/1) as the eluent to give a glassy solid (0.35 g, 85 %). ^{1}H NMR (400 MHz), $CDCl_3$, δ): 8.34 (s, 1H), 4.04 (dd, *J* = 19.1, 4.4 Hz, 2H), 3.41–3.18 (m, 4H), 3.22 – 3.08 (m, 2H), 3.01 (td, *J* = 6.6, 3.6 Hz, 2H), 1.53 (d, *J* = 7.0 Hz, 5H), 1.25 (d, *J* = 3.0 Hz, 39H), 0.88 (t, *J* = 6.7 Hz, 6H). ^{13}C NMR (101 MHz, $CDCl_3$, δ): 175.2, 167.5, 77.6, 60.5, 48.3, 47.2, 47.0, 46.2, 40.8, 32.0, 26.1, 22.7, 14.1. HRMS (*m/z*): $[M + H]^+$ calcd for $C_{30}H_{62}N_3O_2$, 508.4800; found, 508.4835.

Compound 10: To a solution of **9** (0.40 g, 1.10 mmol) in tetrahydrofuran (10 mL), dicyclohexylcarbodiimide (0.22 g, 1.10 mmol) and N-hydroxysuccinimide (0.12 g, 1.25 mmol) were added. The reaction mixture was stirred at room temperature for 12 h. The solid precipitate was filtered off and didodecylamine (0.30 g, 0.56 mmol) and N,N-diisopropylethylamine (0.5 mL, 3.87 mmol) were added to the filtrate. After the mixture was stirred for another 12 h, the organic solvent was removed by rotary evaporation. The residue was dissolved in a minimum amount of methanol and the solution was poured into 100 mL of water. The solution was neutralized by 2 M HCl, followed by extraction with ethyl acetate (3 × 20 mL). The combined organic layers were washed with brine, dried over sodium sulfate, filtered, and concentrated in vacuo. The residue was purified by column chromatography over silica gel using hexane/EtOAc (1/0 to 20/1) as the eluent to give a glassy solid (0.50 g, 64 %). ^{1}H NMR (400 MHz), CDCl$_3$, *δ*): 6.88 (s, 1H), 4.81–4.74 (m, 1H), 4.16 (m, 1H), 3.67 (s, 3H), 3.33-3.05 (m, 4H), 2.32-2.07 (m, 3H), 2.04-1.44 (m, 17H), 1.27 (s, 39H), 0.89 (t, *J* = 6.7 Hz, 6H). ^{13}C NMR (101 MHz, CDCl$_3$, *δ*): 173.12, 172.57, 171.99, 17.50, 155.03, 109.99, 80.29, 61.01, 51.62, 47.97, 46.91, 46.05, 33.91, 31.86, 29.59, 28.25, 27.56, 26.92, 24.60, 23.70, 22.03, 14.07. HRMS (*m/z*): [M + H]$^+$ calcd for $C_{40}H_{76}N_3O_6$, 694.5729; found, 694.5709.

Compound 3: Compound **10** (0.5 g, 0.72 mmol) was dissolved in MeOH (5mL). A solution of 1 N NaOH (1.0 mL, 1.0 mmol) was added over a period of 30 min. After 2 h, another batch of 1 N NaOH (0.3 mL, 0.3 mmol) was added. After 1 h of stirring, the reaction mixture was poured into water (100 mL) and then neutralized with 2 M HCl. The aqueous solution was extracted with EtOAc (2 × 25 mL). The combined organic solution was washed with brine, dried over sodium sulfate, and concentrated in vacuo. The residue was dissolved in a mixture of dichloromethane (10 mL) and triflouroacetic acid (1.7 mL, 16 mmol). After 2 h at room temperature, the reaction mixture was poured into 100 mL of water and neutralized by saturated sodium carbonate, followed by extraction with ethyl acetate (3 × 20 mL). The combined organic layers were washed with brine, dried over sodium sulfate, filtered, and concentrated in vacuo. The residue was purified by column chromatography over silica gel using dichlormethane/MeOH (10/1) as the eluent to give a glassy solid (0.30 g, 88 %). ^{1}H NMR (400 MHz, Methanol-d$_4$, *δ*): 7.88 (s, 1H), 4.81–4.74 (m, 1H), 4.04 (m, 1H), 3.63-3.47 (m, 2H), 3.33-3.05 (m, 4H), 2.32-2.07 (m, 3H), 2.04-1.44 (m, 6H), 1.27 (s, 39H), 0.89 (t, *J* = 6.7 Hz, 6H). ^{13}C NMR (101 MHz, Methanol-d$_4$, *δ*): 179.33, 171.90, 171.60, 130.98, 129.47, 67.62, 59.48, 49.26, 47.22, 47.02, 46.22, 40.83, 38.761, 24.35, 23.56, 22.67, 22.39, 13.10. HRMS (*m/z*): [M + H]$^+$ calcd for $C_{34}H_{66}N_3O_4$, 580.5048; found, 580.5053.

^{1}H and ^{13}C NMR spectra



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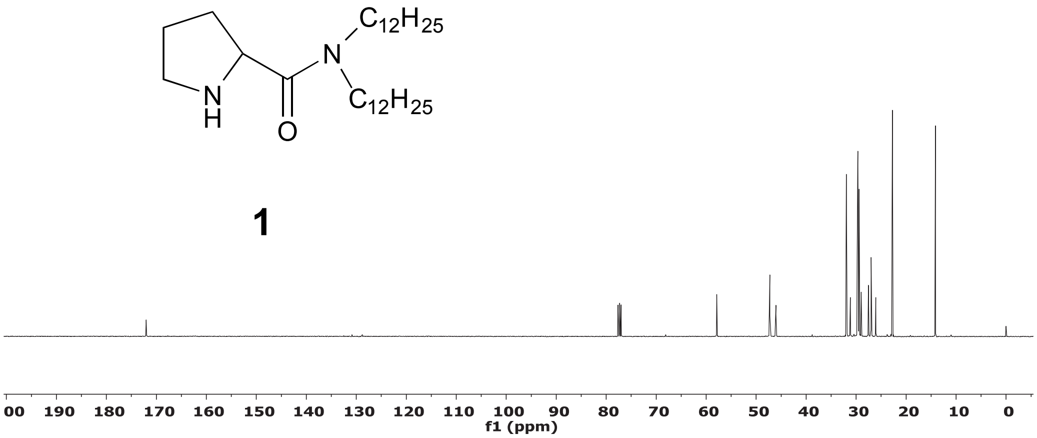

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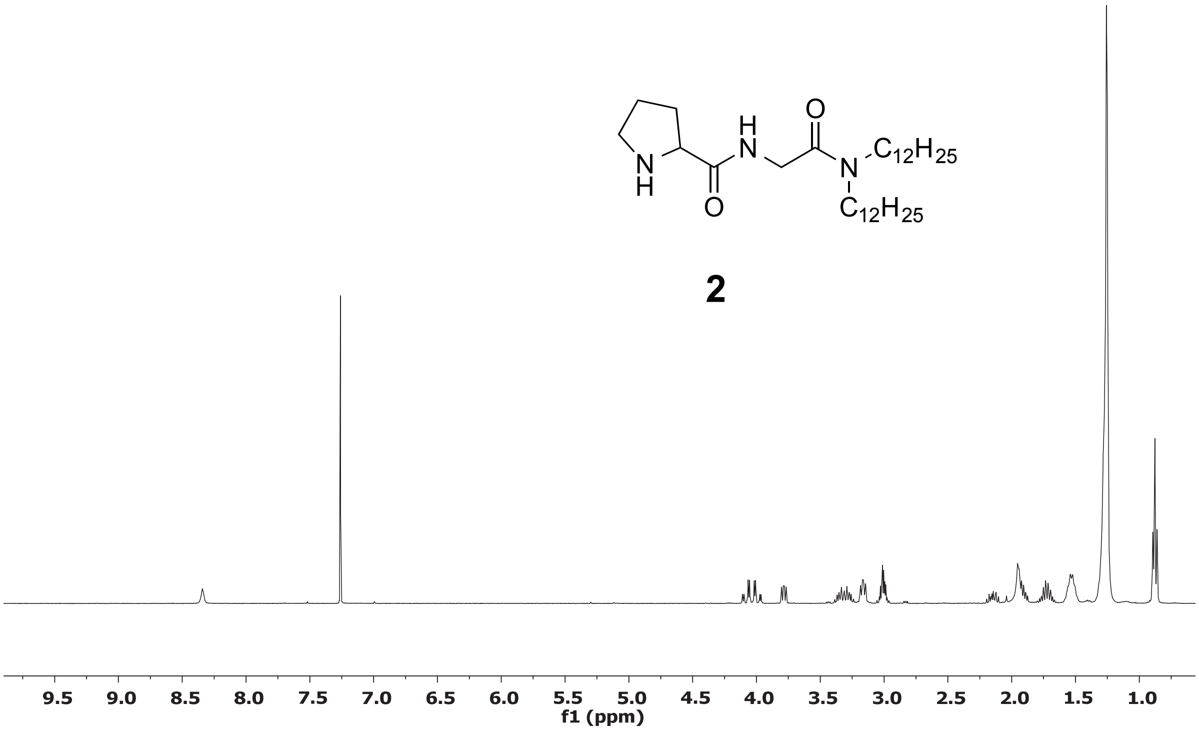
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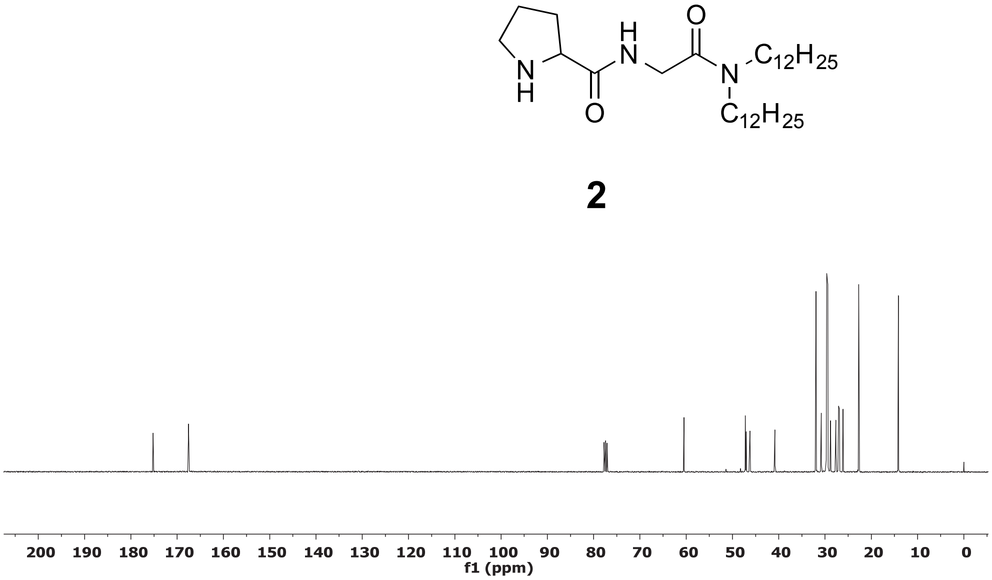
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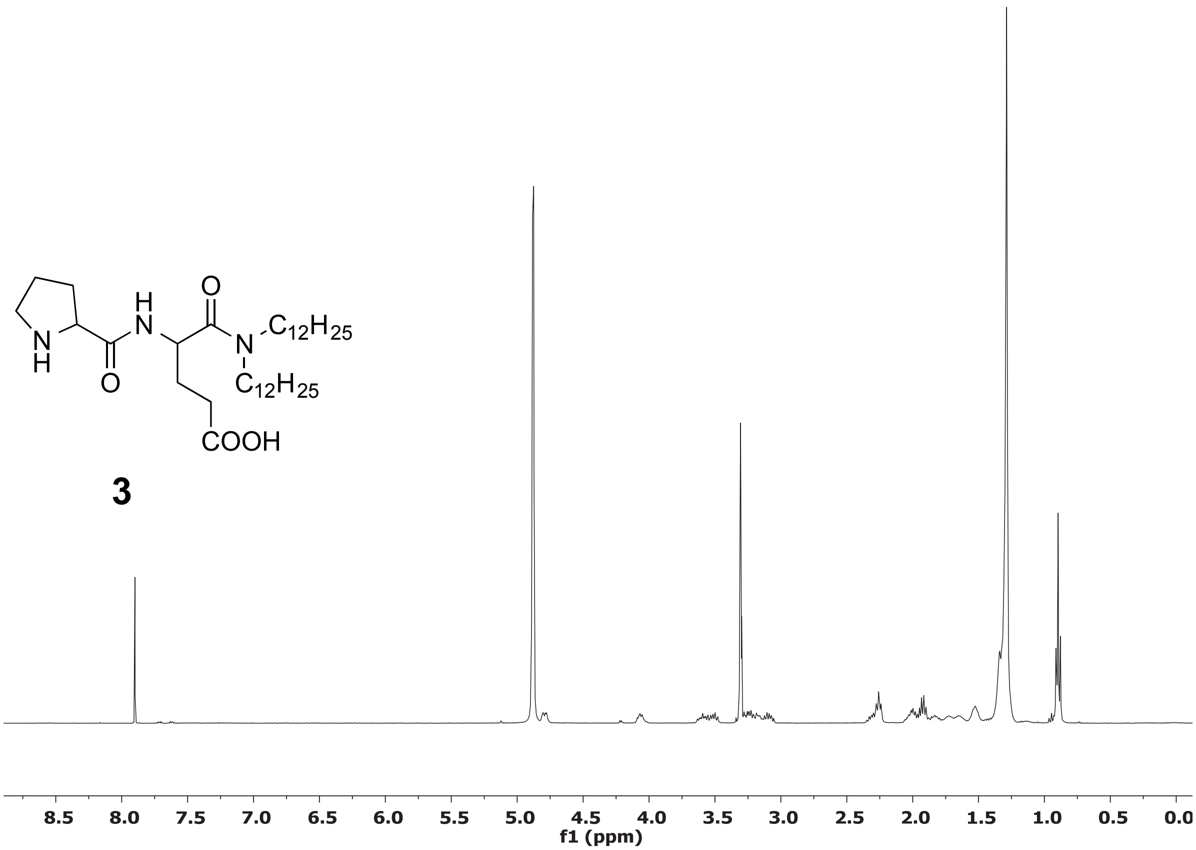
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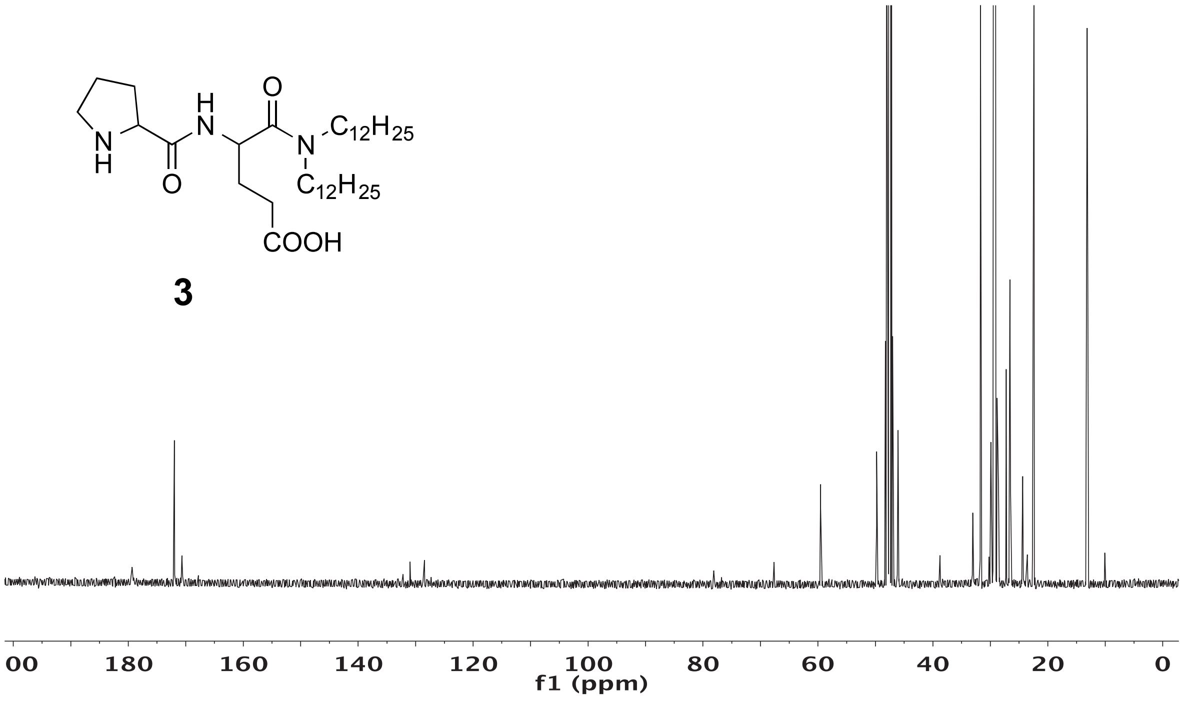
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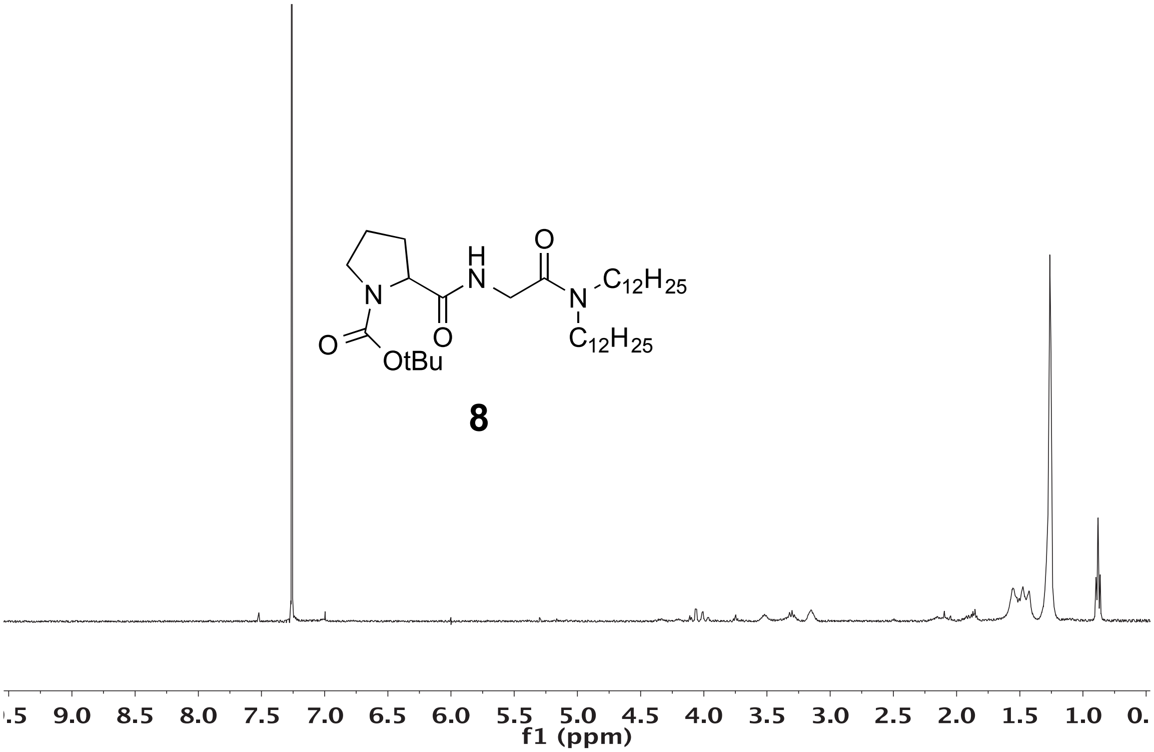

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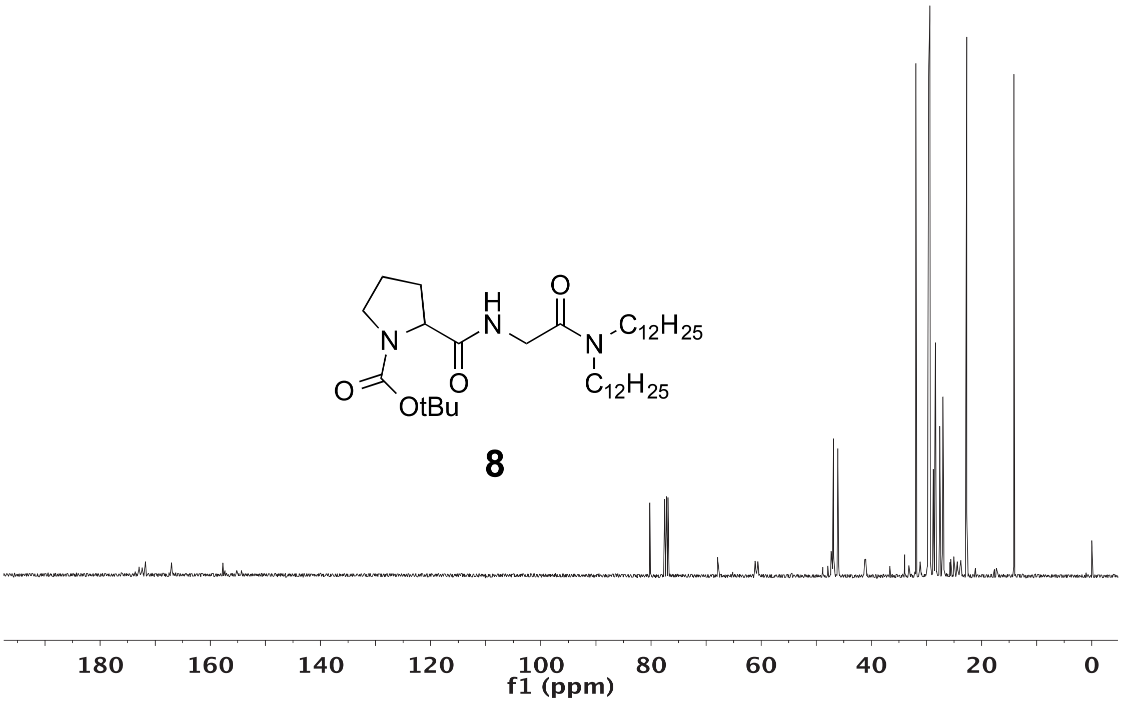

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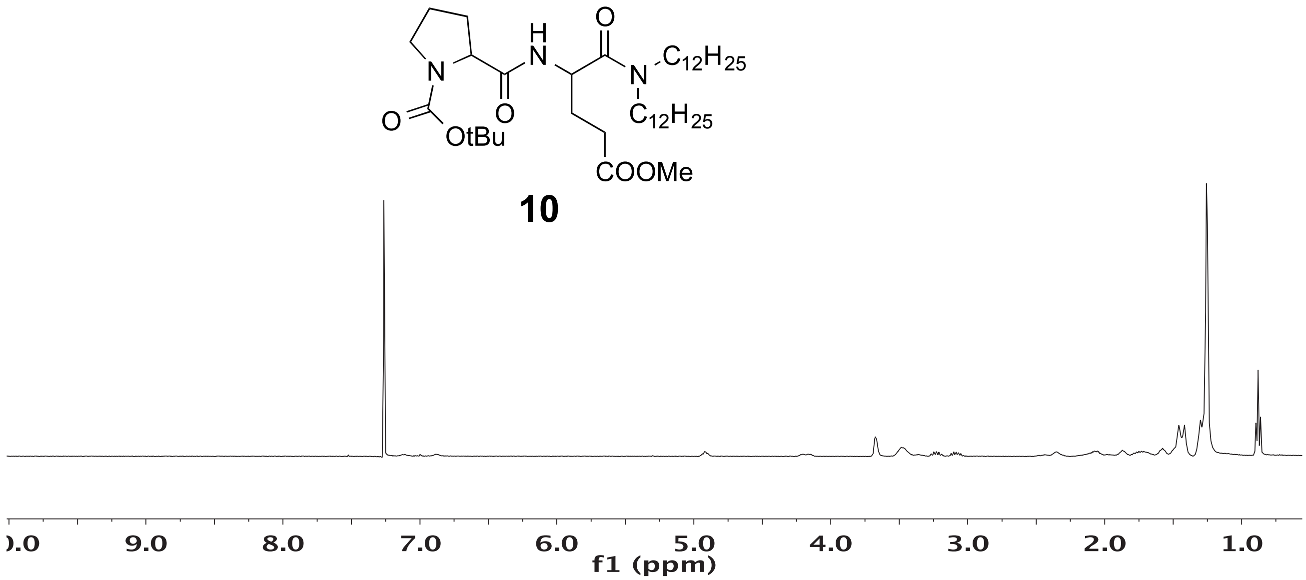

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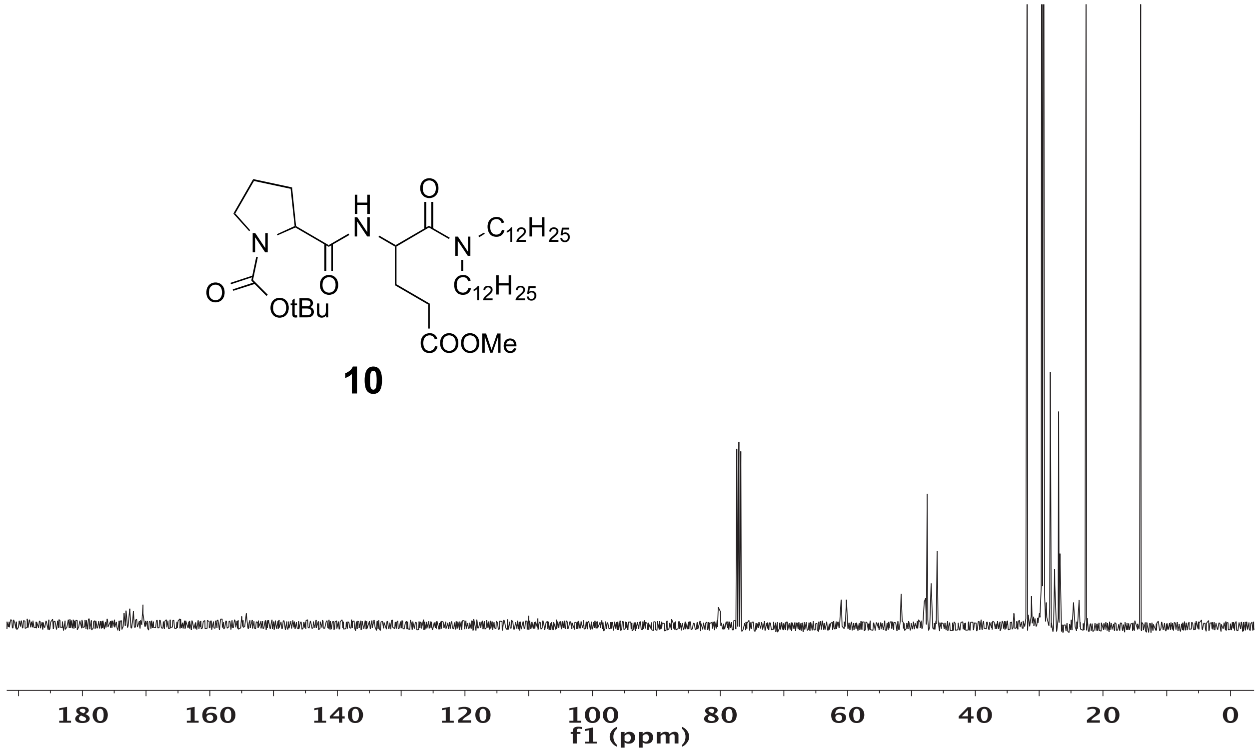

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