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## Supplementary Data

### Synthesis of lactams using enzyme-catalyzed aminolysis

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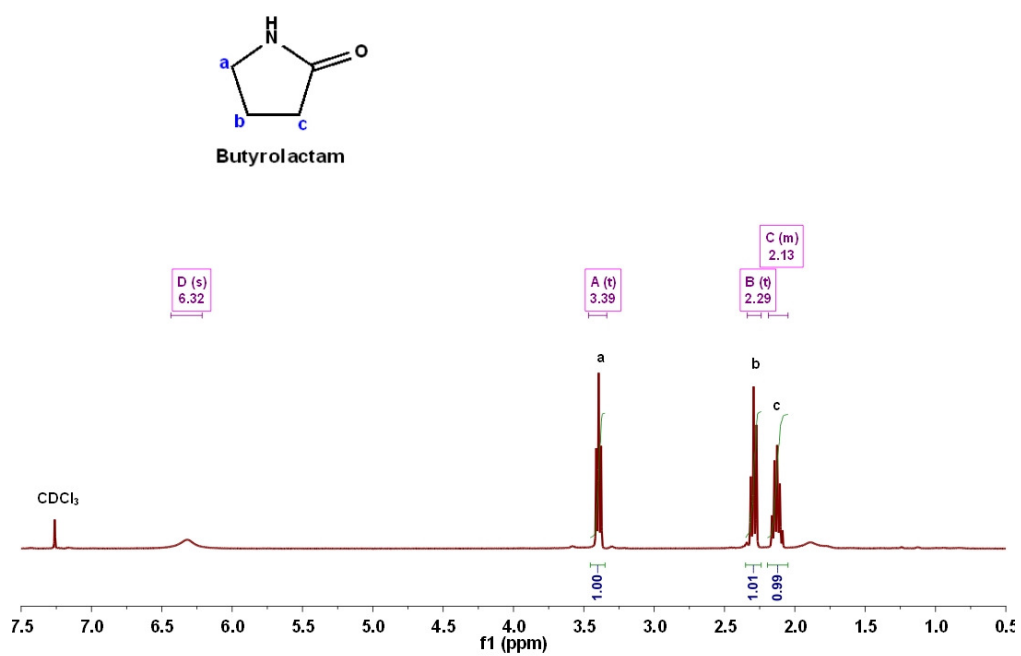


Figure. S1. <sup>1</sup>H NMR spectrum of butyrolactam

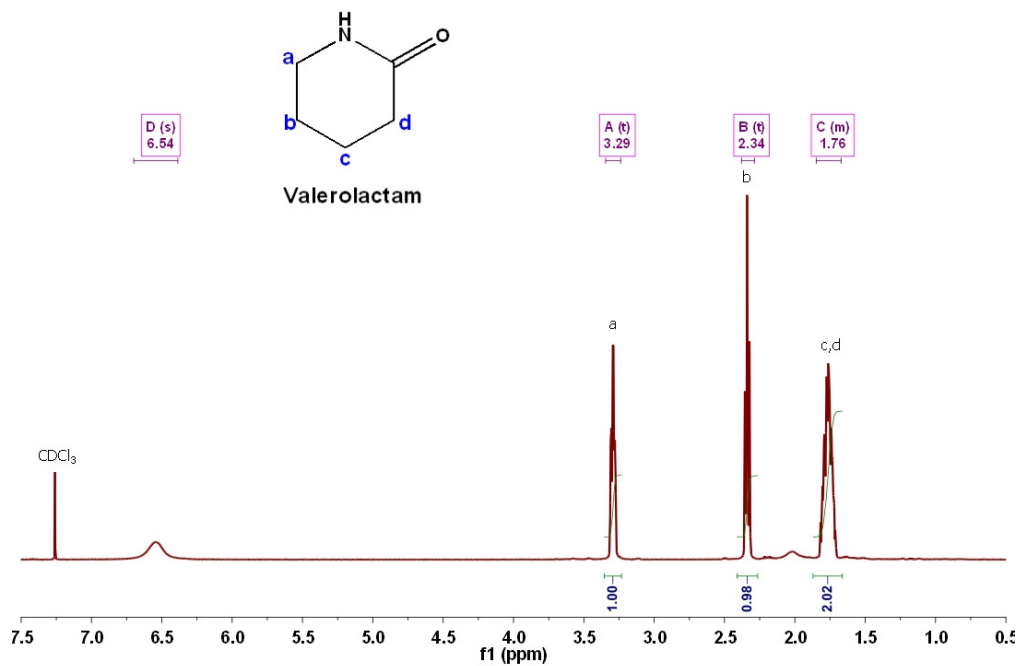


Figure. S2.  $^1\text{H}$  NMR spectrum of  $\delta$ -valerolactam

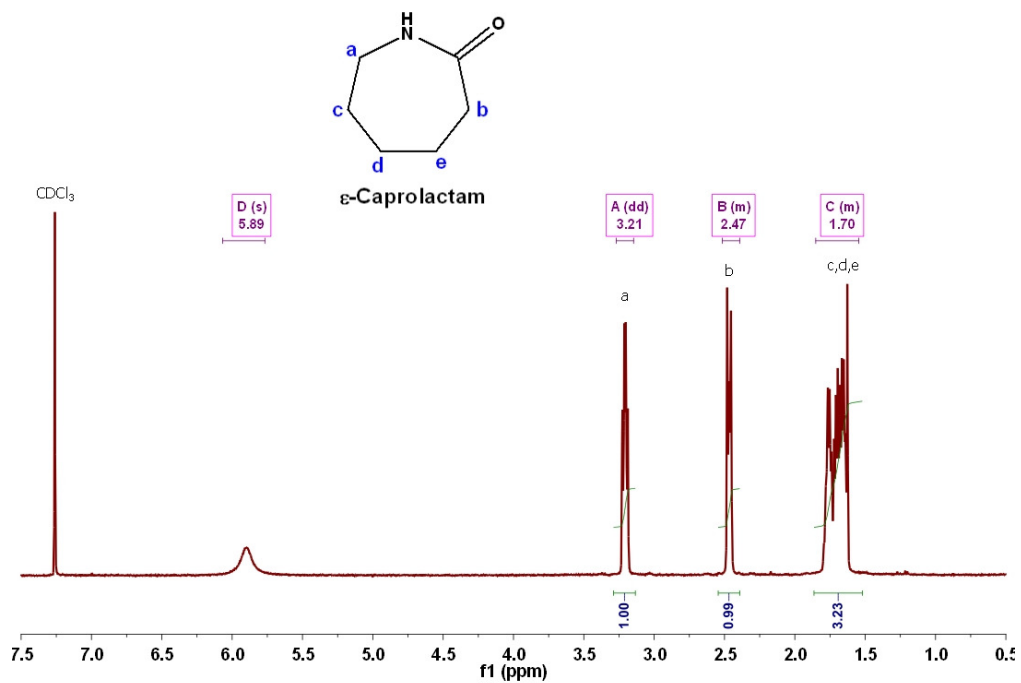


Figure. S3.  $^1\text{H}$  NMR spectrum of  $\epsilon$ -caprolactam

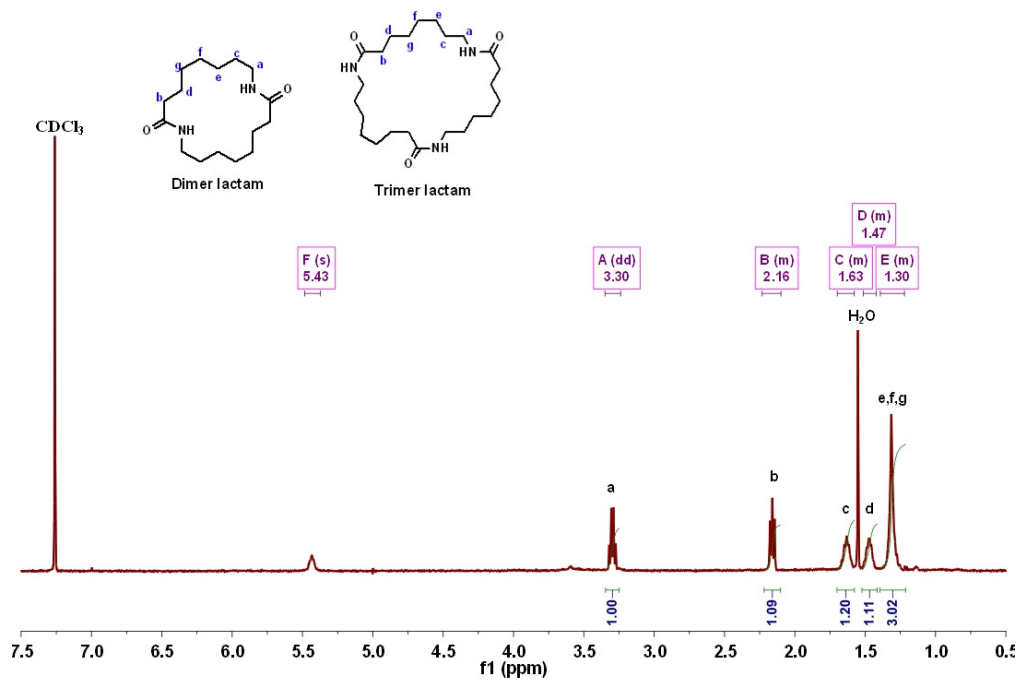


Figure. S4.  $^1\text{H}$  NMR spectrum of dimer and trimer lactams

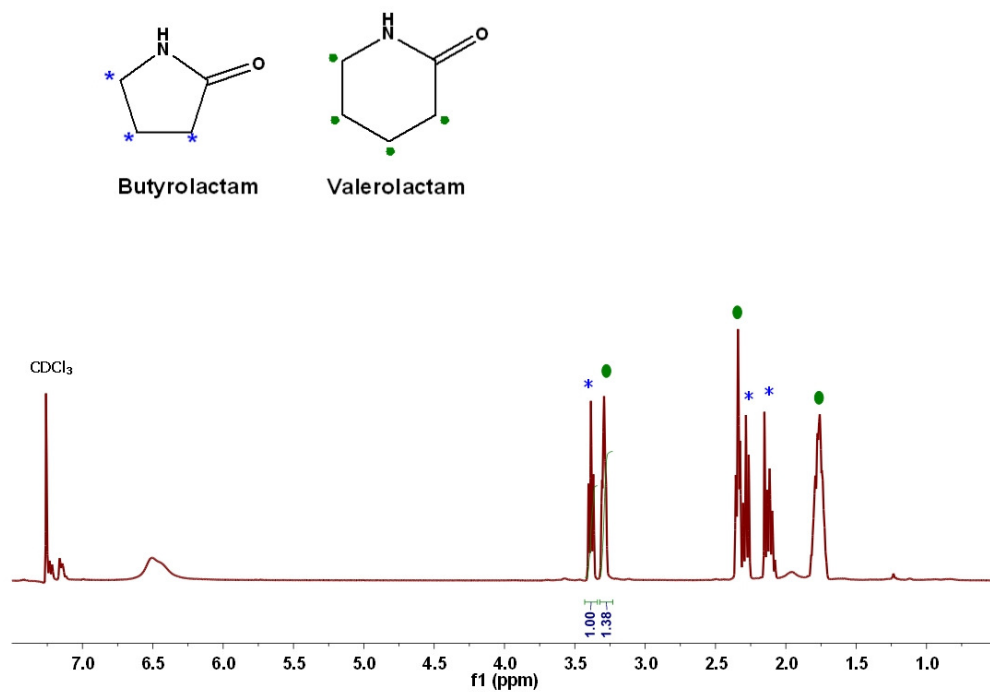


Figure. S5.  $^1\text{H}$  NMR spectrum from crude product of reaction between 4-aminobutanoic acid with 5-aminovaleric acid

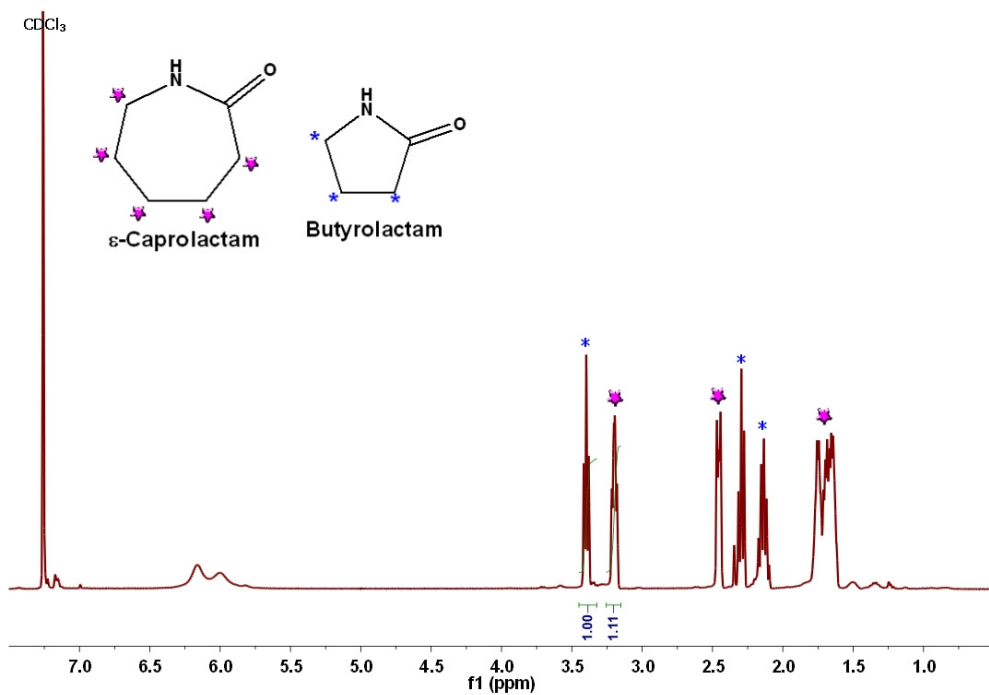


Figure. S6.  $^1\text{H}$  NMR spectrum from crude product of reaction between 4-aminobutanoic acid with 6-aminocaproic acid

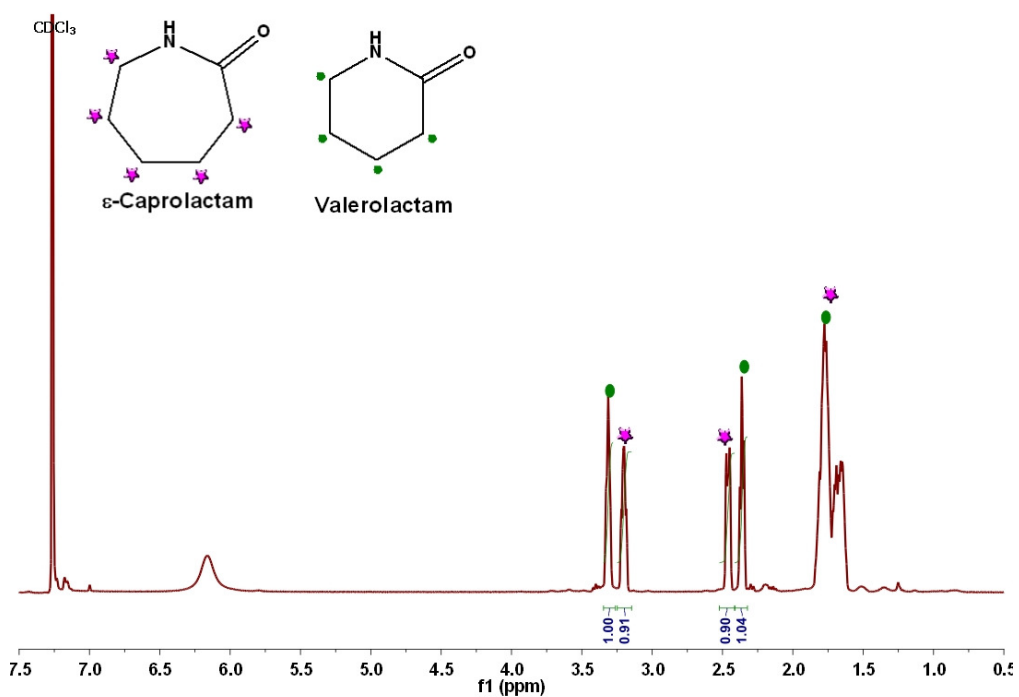


Figure. S7.  $^1\text{H}$  NMR spectrum from crude product of reaction between 5-aminovaleric acid with 6-aminocaproic acid

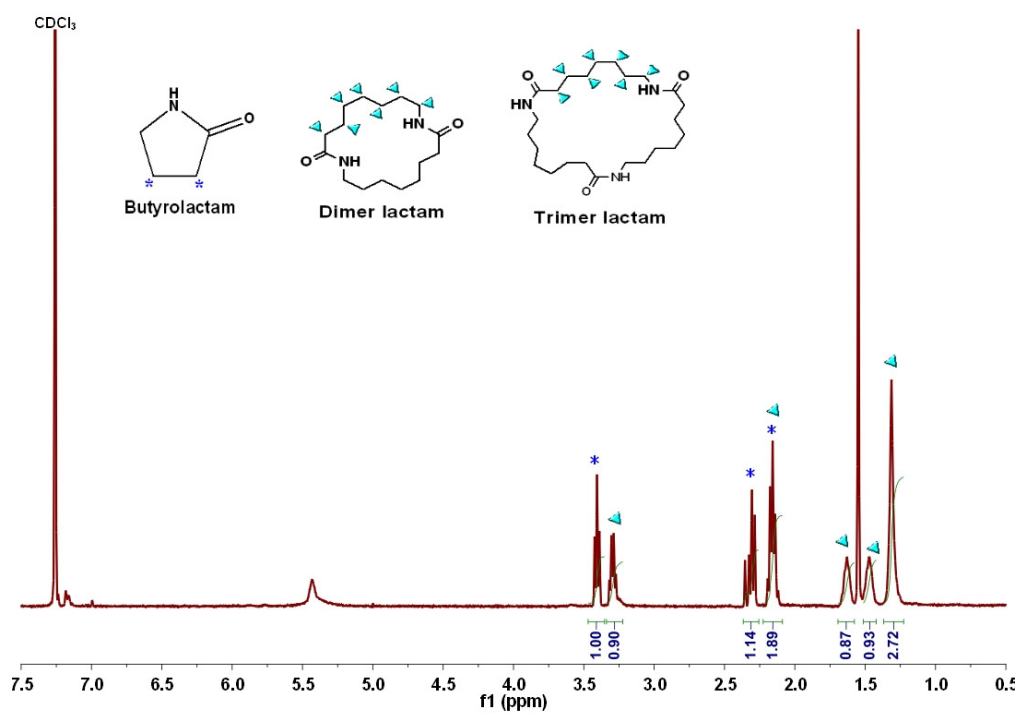


Figure. S8.  $^1\text{H}$  NMR spectrum from crude product of reaction between 4-aminobutanoic acid with 8-aminooctanoic acid

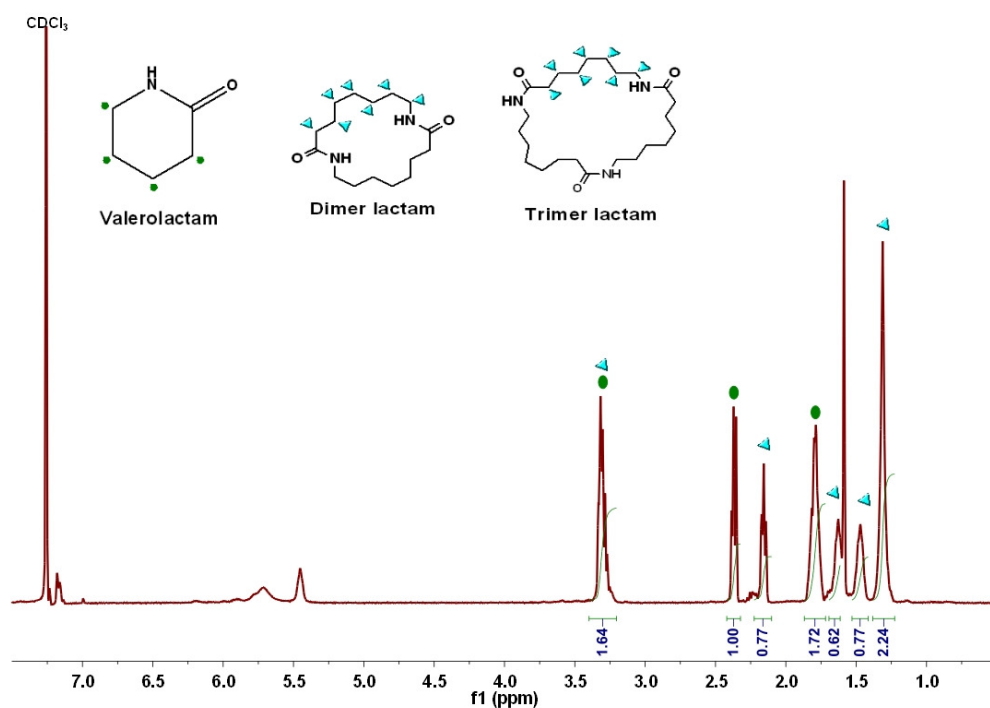


Figure. S1.  $^1\text{H}$  NMR spectrum from crude product of reaction between 5-aminovaleric acid with 8-aminooctanoic acid

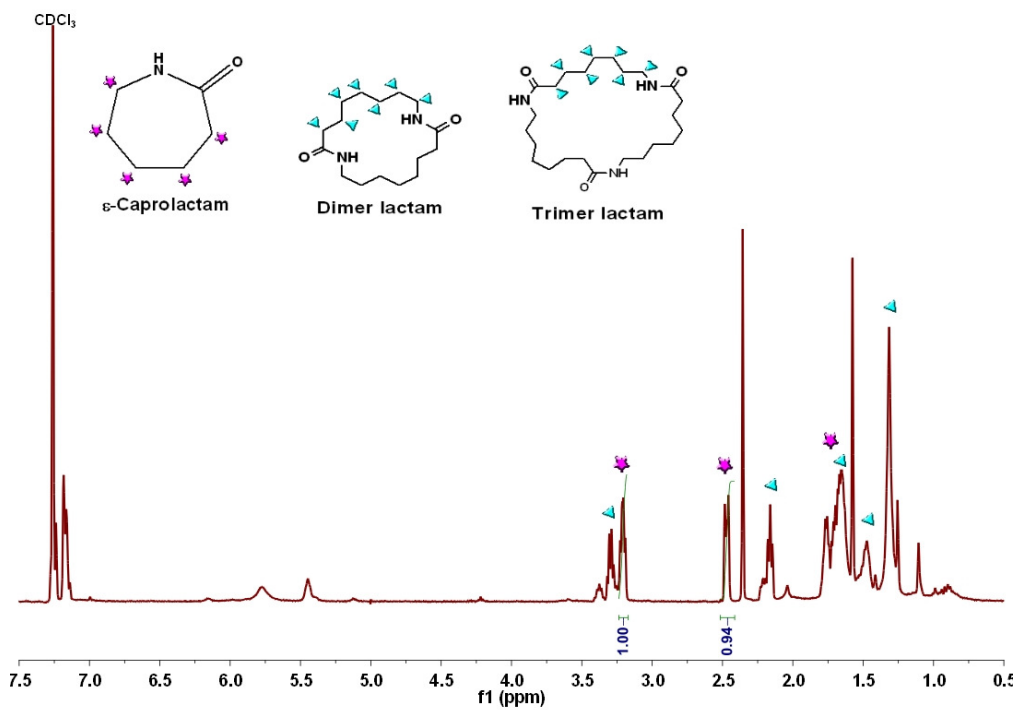


Figure. S10.  $^1\text{H}$  NMR spectrum from crude product of reaction between 6-aminocaproic acid with 8-aminooctanoic acid

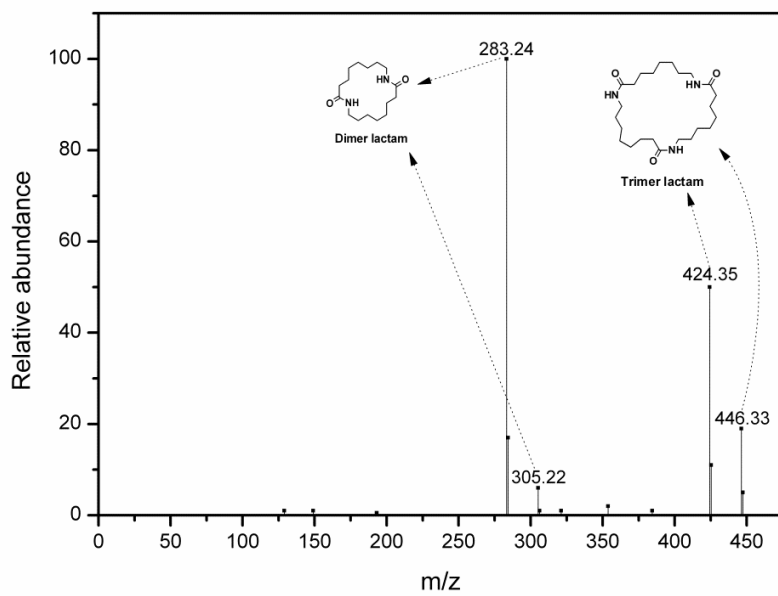


Figure. S11. Mass spectrometry (ESI) chromatogram of dimer and trimer lactams

**Transesterification assay:** A mixture of deactivated N435 (10 mg) and toluene (20 mL) was stirred at 40 °C, and a solution of 4-nitrophenyl acetate (5 mL, 7.25 mmol L<sup>-1</sup>) in toluene was added. Immediately methanol (6 μL) was added to the mixture. After 15 minutes, three samples were taken from the mixture and filtered to remove N435 beads. Of each sample, 0.5 mL of the filtrate was dissolved in 9.5 mL toluene, and the resulting solution was used for the UV-absorption measurement.  $\epsilon$  pNP (toluene, 304 nm) = 9537 M<sup>-1</sup> cm<sup>-1</sup> and  $\epsilon$  pNPA (toluene, 304 nm) = 2703 M<sup>-1</sup> cm<sup>-1</sup>.

**Synthetic activity assay:** A mixture of deactivated N435 (100 mg) and toluene was stirred at 90 °C.  $\epsilon$ -Caprolactone (1 mL, 9 mmol) was added and stirred for 5h. After 3d, 2 drops of the reaction mixture were withdrawn, and the conversion of  $\epsilon$ -caprolactone was analyzed with <sup>1</sup>H NMR spectroscopy.

Table S1. Residual activity of N435 deactivated by heat treatment

N435	Deactivated [h]	Conversion of $\epsilon$ -Caprolactam [%]	Transesterification Activity [nmol PNP min <sup>-1</sup> mg <sup>-1</sup> ] <sup>a</sup>	Synthetic Activity Conversion [%] <sup>a</sup>	DPn <sup>a</sup>
1	4	11	59 ± 13	58	8 ± 2
2	24	11	22 ± 0.2	41	3 ± 1

<sup>a</sup>Standard deviation values were calculated from three replicate experiments.