

## Supporting Information

# Discriminating D-Amino Acid Containing Peptide Epimers by Radical Directed Dissociation Mass Spectrometry

*Yuanqi Tao\*, Neil Quebbemann\*, Ryan R. Julian†*

\* Department of Chemistry, University of California, Riverside, California, 92521

† **Corresponding author:** Ryan R. Julian, Department of Chemistry, University of California, Riverside, California, 92521

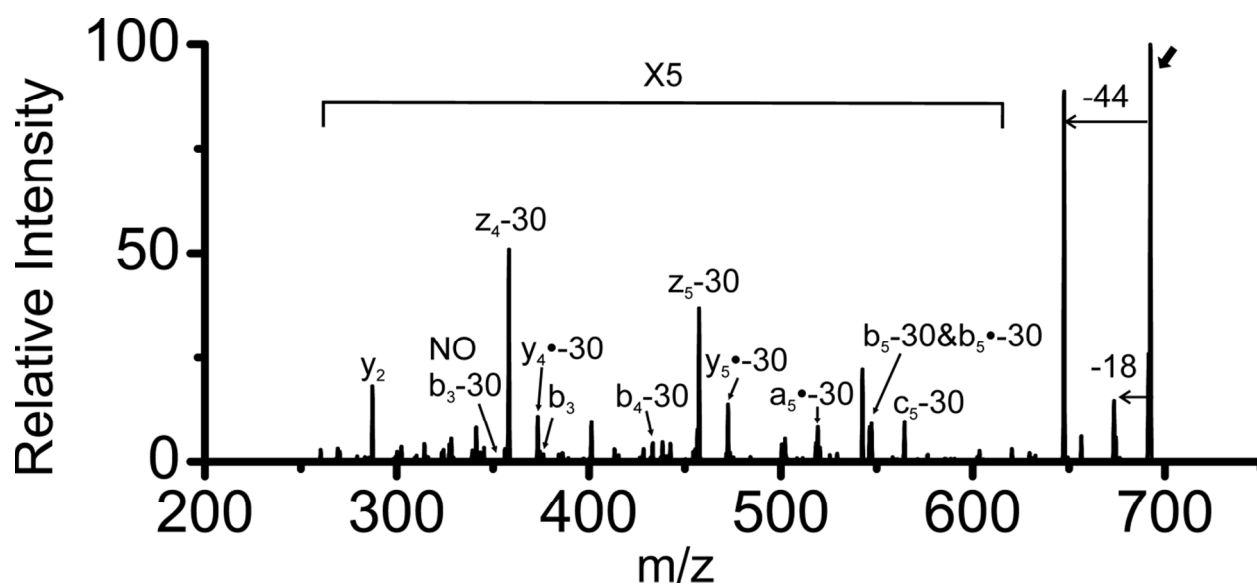
**Phone:** (951) 827-3958,

**Email:** ryan.julian@ucr.edu

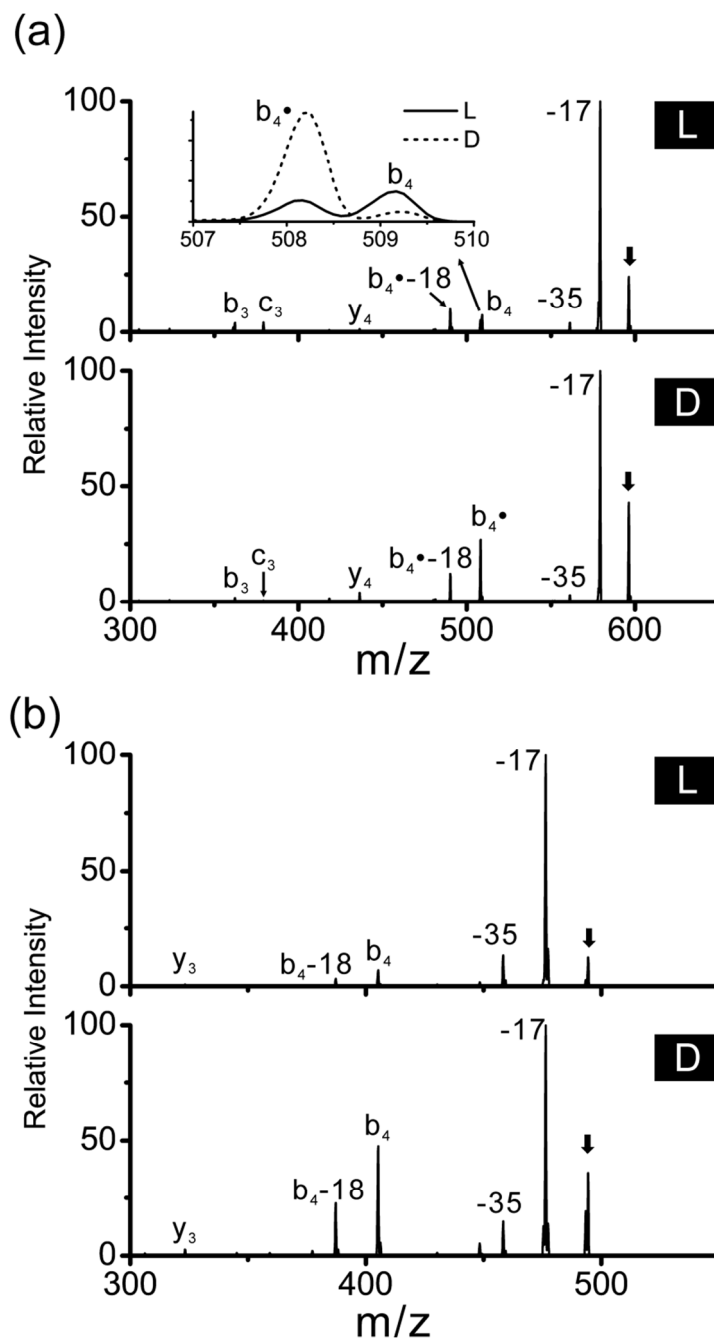
### Abstract for Supporting Information

The supporting information contains some experimental details and several mass spectra for the D-amino acid containing peptides mentioned in the text. The first figure confirms the -30 loss from PD of D-ser <sup>1</sup>DVGSNK-NH<sub>2</sub> is from serine side chain. Figure S-2 and S-3 compare RDD and CID spectra for GLSFA-NH<sub>2</sub> and GSWD. Figure S-4 and S-5 show the radical transfer efficiency differences for YAFDVVG-NH<sub>2</sub> and ASTTTNYT-NH<sub>2</sub>.

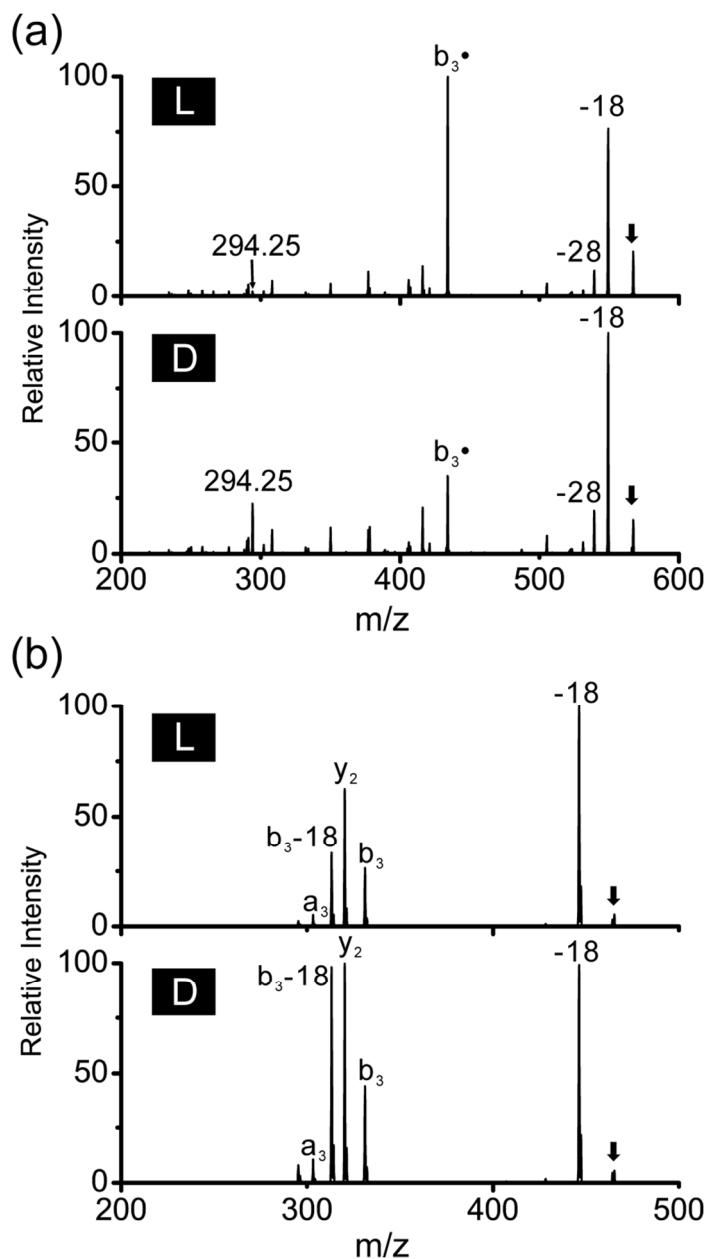
**Figure S-1.** CID of -30 loss from PD of [ $^1\text{DVG}\underline{\text{S}}\text{NK-NH}_2 + \text{H}$ ] $^+$  (D-ser epimer). A series of  $b_3$ ,  $b_4$ -30,  $b_5$ -30 fragments are observed, while  $b_3$ -30 ion is not present in the spectrum, which verifies that the -30 loss is from serine.



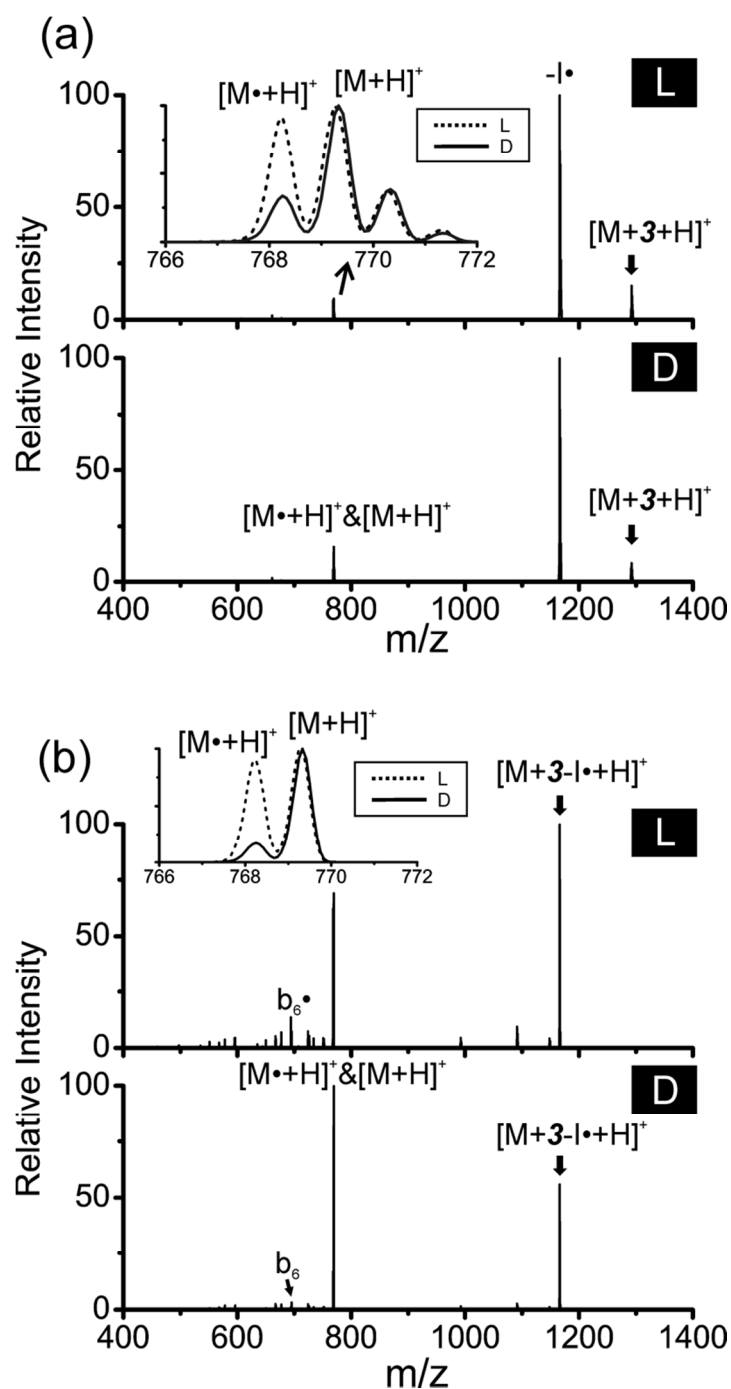
**Figure S-2.** (a) PD-CID of  $[^1\text{GL}\underline{\text{S}}\text{FA-NH}_2 + \text{H}]^+$  and (b) CID of  $[\text{GL}\underline{\text{S}}\text{FA-NH}_2 + \text{H}]^+$ . Relative intensities of  $b_4^\bullet$  are significantly different between the two epimers. The  $R_{\text{Chiral}}$  value is  $32 \pm 4$  ( $b_4^\bullet/c_3$ ) for RDD and  $6.9 \pm 0.2$  ( $b_4-18/-17$ ) for CID.



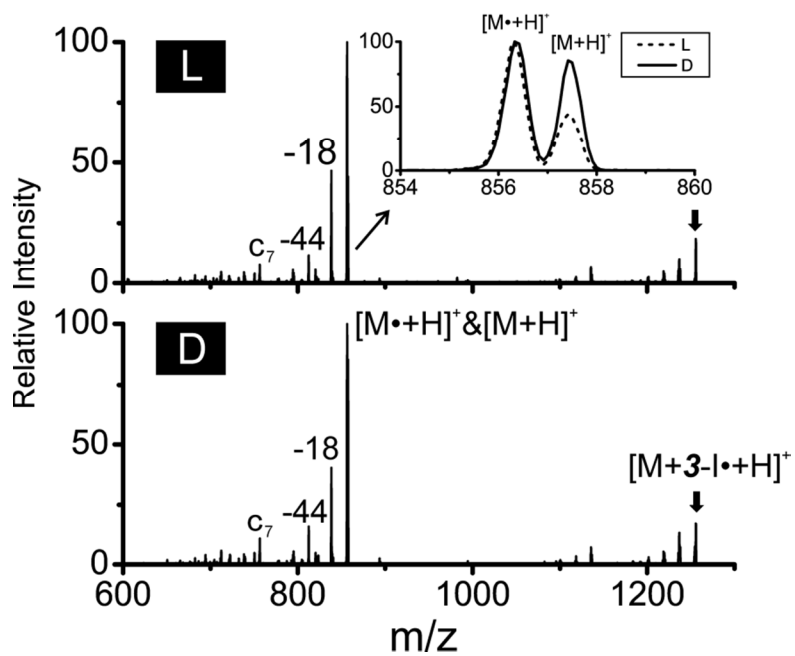
**Figure S-3.** (a) PD-CID of [ $^1\text{G}\underline{\text{S}}\text{WD} + \text{H}$ ] $^+$  and (b) CID of [ $\text{G}\underline{\text{S}}\text{WD} + \text{H}$ ] $^+$ . RDD shows a better chiral discrimination ability with a  $R_{\text{Chiral}}$  value of  $12 \pm 1$  (peak 294.17/ $b_3^\bullet$ ) while the number for CID is  $1.85 \pm 0.05$  ( $b_3-18/y_2$ ).



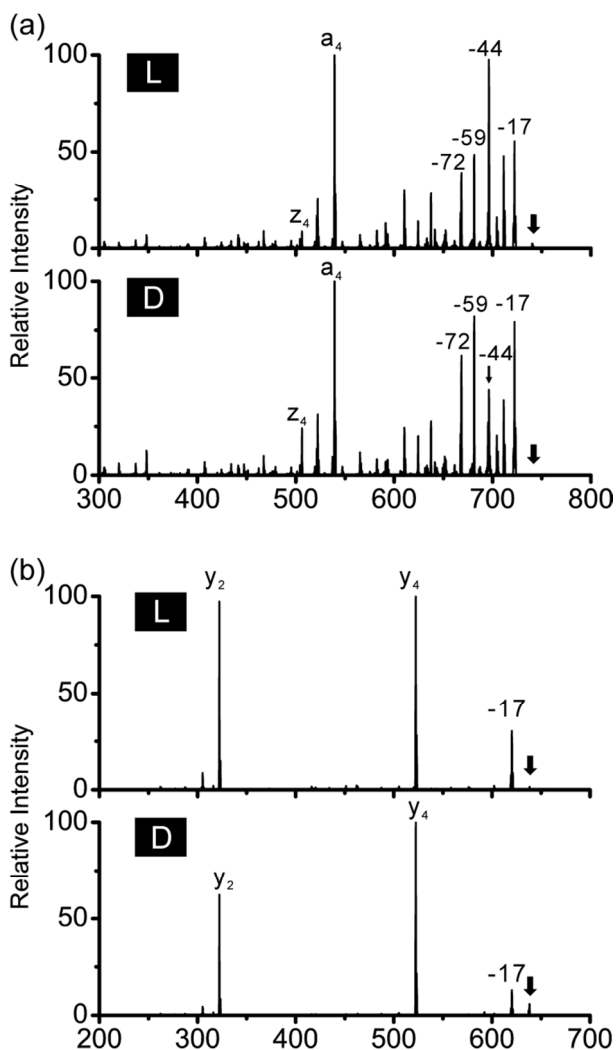
**Figure S-4.** (a) PD of  $[\text{YA}\underline{\text{F}}\text{DVVG-NH}_2+3\text{H}]^+$  and (b) PD-CID of  $[\text{YA}\underline{\text{F}}\text{DVVG-NH}_2+3\text{H}]^+$  epimers. The hydrogen abstraction efficiency is limited in the D-Ala peptide.



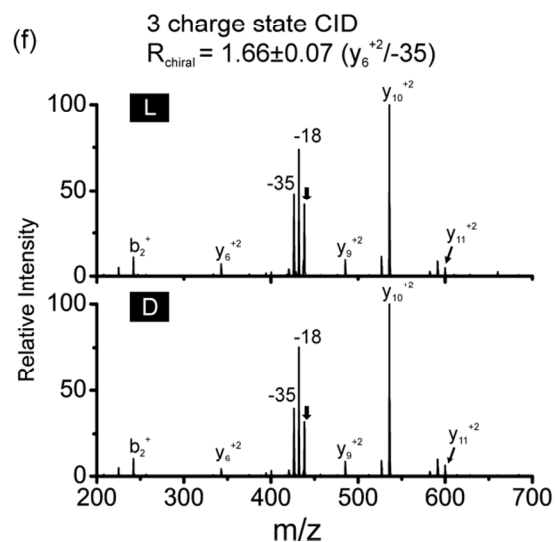
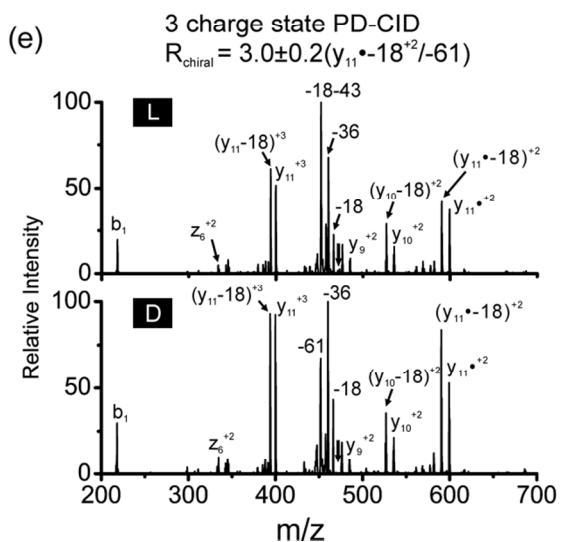
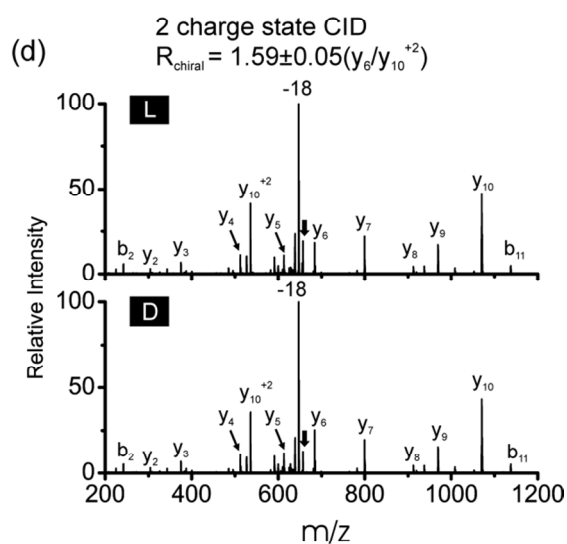
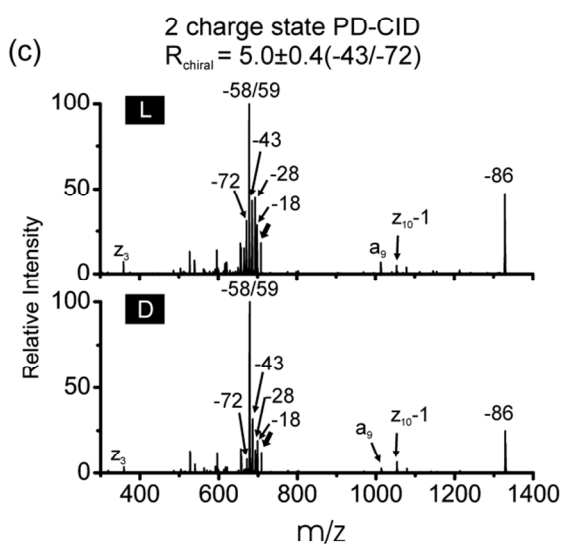
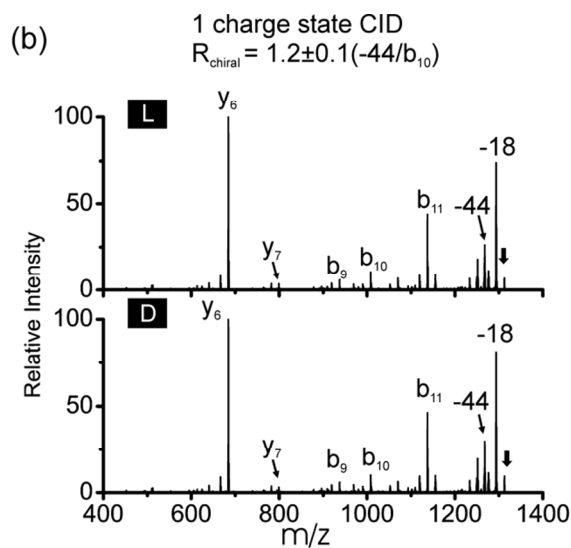
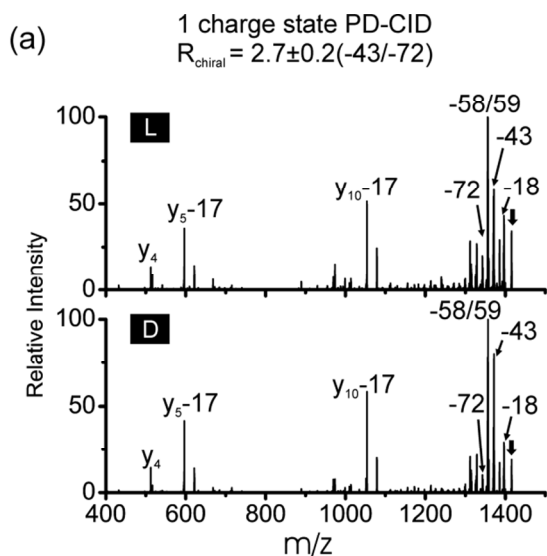
**Figure S-5.** PD-CID of  $[\text{A}\text{STTTNYT-NH}_2+3+\text{H}]^+$  epimers. The radical transfer efficiency difference is very easy to identify.



**Figure S-6.** (a) PD-CID of [ $^1\mathbf{D}$ AEFR + H] $^+$  and (b) CID of [ $\mathbf{D}$ AEFR + H] $^+$  epimers. RDD shows a better chiral discrimination ability with a  $R_{\text{Chiral}}$  value of  $6.2 \pm 0.3$  (peak  $z_4^+/-44$ ) while the number for CID is  $2.33 \pm 0.07$  ( $y_4^+/-17$ ).



**Figure S-7.** (a) PD-CID of [ $^1\mathbf{IQTGLD}$ ATHAER+H] $^+$  epimers. (b) CID of [ $\mathbf{IQTGLD}$ ATHAER+H] $^+$  epimers. (c) PD-CID of [ $^1\mathbf{IQTGLD}$ ATHAER+2H] $^{2+}$  epimers. (d) CID of [ $\mathbf{IQTGLD}$ ATHAER+2H] $^{2+}$  epimers. (e) PD-CID of [ $^1\mathbf{IQTGLD}$ ATHAER+3H] $^{3+}$  epimers. (f) CID of [ $\mathbf{IQTGLD}$ ATHAER+3H] $^{3+}$  epimers. This demonstrated that RDD provides better chiral discrimination than CID in different charge states.





**Synthesis of IBA-18C6.** 0.50 mmol DCC in 5.0 mL dioxane was added to a 50 mL round bottom flask containing 0.50 mmol of 4-iodobenzoic acid and 0.50 mmol 2-hydroxymethyl-18-crown-6 ether. A catalytic amount of DMAP (~10 mg) was added. After a 12 h reaction period, a crystalline hair-like precipitate was observed. The precipitate was removed by filtration. The filtrate was then evaporated over nitrogen.