

Supplementary Materials

Electron Ionization of Size-Selected Positively and Negatively Charged Helium Droplets

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Table S1. Appearance energies (AE) and resonances (plotted in italic) for electron ionization of cationic helium droplets obtained by the vanishing current method from the ion efficiency curves shown in Figure 4 in the main text, Figures S1 and S2. All appearance energies listed possess an error of ± 1 eV due to uncertainties in determination of the background signal, while resonance energies should be treated with an error of ± 0.65 eV due to the electron energy resolution.

Reaction process	AE (eV)	AE (eV)	AE (eV)
	2.7×10^6 He/z 7 K	5.7×10^6 He/z 7 K	4×10^6 He/z 9 K
+1 \rightarrow +2	21.4, 42.3	21.5	21.0
+1 \rightarrow +3	23.0, 42.3	23.4, 42.9	22.2
+1 \rightarrow +4	25.8, 42.7	25.4, 43.2	25.3
+1 \rightarrow +5		26.5, 43.0	27.9
+1 \rightarrow +6		28.1	29.5
+1 \rightarrow +7			30.2
+1 \rightarrow +8			31.8
+1 \rightarrow +9			33.2
+2 \rightarrow +3		21.5, 44.1	
+2 \rightarrow +5		24.8, 43.0	
+2 \rightarrow +7		26.9, 44.1	
+3 \rightarrow +4		21.5, 44.2	
+3 \rightarrow +5		23.7, 44.0	
+3 \rightarrow +7		26.0	
+3 \rightarrow +8		27.3, 43.0	
+4 \rightarrow +5		21.3, 44.0	
+4 \rightarrow +9		27.2	
+5 \rightarrow +6		21.1, 43.9	
+5 \rightarrow +7		23.5, 44.0	
+5 \rightarrow +8		24.6, 43.9	
+5 \rightarrow +9		26.8, 43.9	
+6 \rightarrow +7		21.4, 44.0	
+7 \rightarrow +8		21.6, 44.0	
+7 \rightarrow +9		23.3, 43.9	
+7 \rightarrow +10		25.1, 44.0	
+8 \rightarrow +9		21.3, 43.9	
+9 \rightarrow +10		21.3, 44.0	
+10 \rightarrow +11		21.3, 43.9	

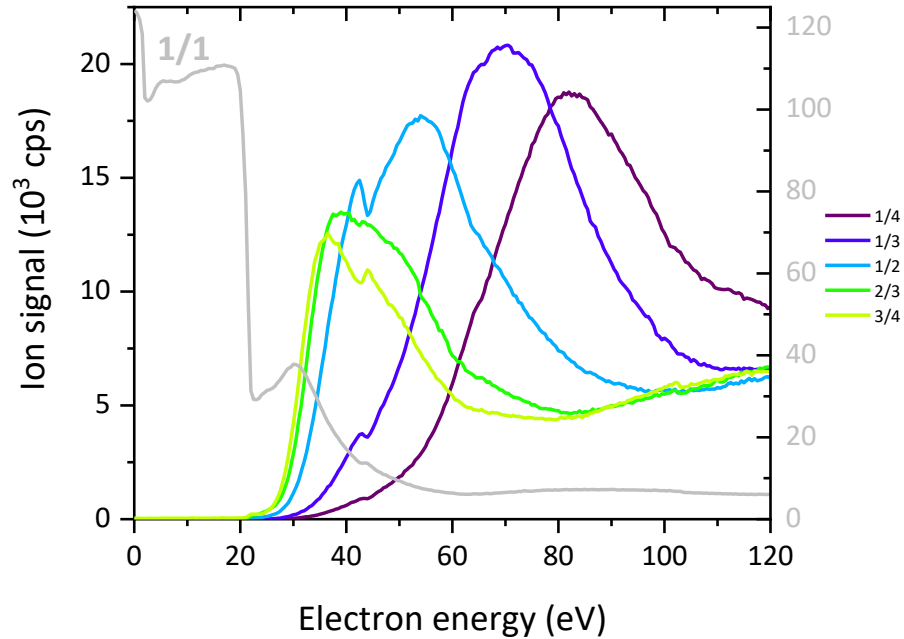


Figure S1. Ion efficiency curves for electron ionization of positively charged He droplets with a mass per charge ratio of 2.7 million He atoms per charge. The curves labels are sorted according to the ratio of the precursor to final charge state.

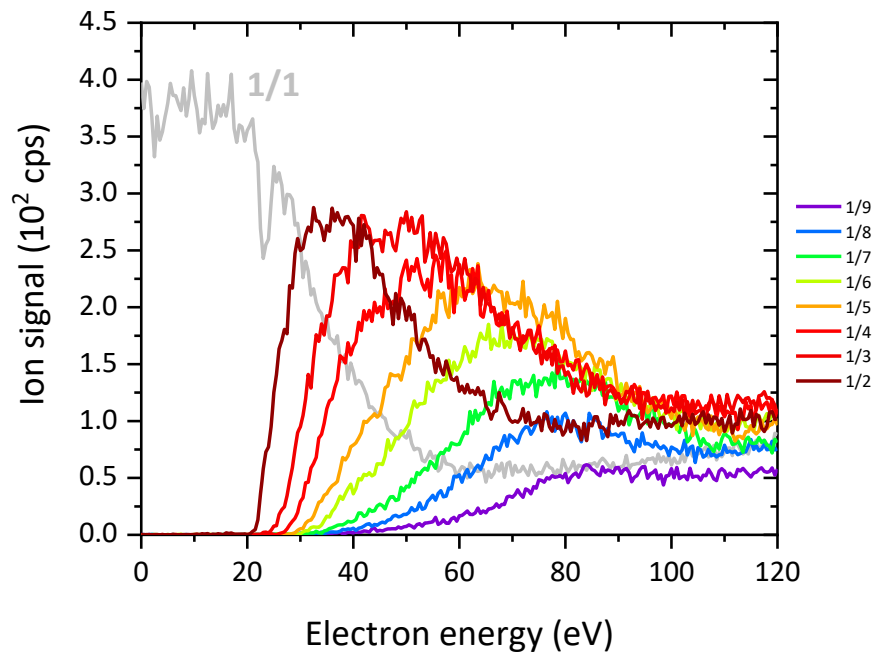


Figure S2. Ion efficiency curves for electron ionization of positively charged He droplets with a mass per charge ratio of 4 million He atoms per charge. The curves labels are sorted according to the ratio of the precursor to final charge state.

Table S2. Resonance energies (RE) for partial neutralization of multiply charged cationic helium droplets upon electron irradiation obtained from the ion efficiency curves shown in Figure 6 in the main text and Figure S3. All resonance energies listed should be treated with an error of ± 0.65 eV due to limited electron energy resolution.

Reaction process	RE (eV)	RE (eV)
	2.7 $\times 10^6$ He/z 7 K	5.7 $\times 10^6$ He/z 7 K
+2 \rightarrow +1	22.3, 26.0	22.2, 25.8
+3 \rightarrow +2	21.9, 27.0	22.0, 26.2
+4 \rightarrow +3	21.6, 27.5	21.7, 27.1
+5 \rightarrow +4	21.5, 28.7	
+6 \rightarrow +5	21.3, 29.1	
+7 \rightarrow +6	21.1, 29.2	
+8 \rightarrow +7	21.1, 29.9	
+7 \rightarrow +4	22.0, 26.5	
+7 \rightarrow +5	21.7, 27.4	
+8 \rightarrow +5	22.0, 26.9	
+9 \rightarrow +4	22.2, 25.8	
+9 \rightarrow +5	2.5, 22.1, 26.4, 44.8	
+10 \rightarrow +7	2.5, 21.7, 27.4, 44.7	
+11 \rightarrow +4	22.4, 25.7	
+11 \rightarrow +5	22.3, 26.0	
+11 \rightarrow +6	2.5, 22.1, 26.4, 44.8	
+11 \rightarrow +7	2.5, 21.9, 27.0, 44.6	
+5 \rightarrow +2	22.4, 25.8	
+5 \rightarrow +3	2.5, 22.0, 26.6, 44.8	
+7 \rightarrow +2	22.4, 25.3	
+7 \rightarrow +3	22.3, 25.9	
+8 \rightarrow +3	22.3, 25.6	
+10 \rightarrow +3	22.3, 25.4	
+11 \rightarrow +3	22.4, 25.2	
+13 \rightarrow +3	22.4, 25.3	
+14 \rightarrow +3	22.3, 25.4	

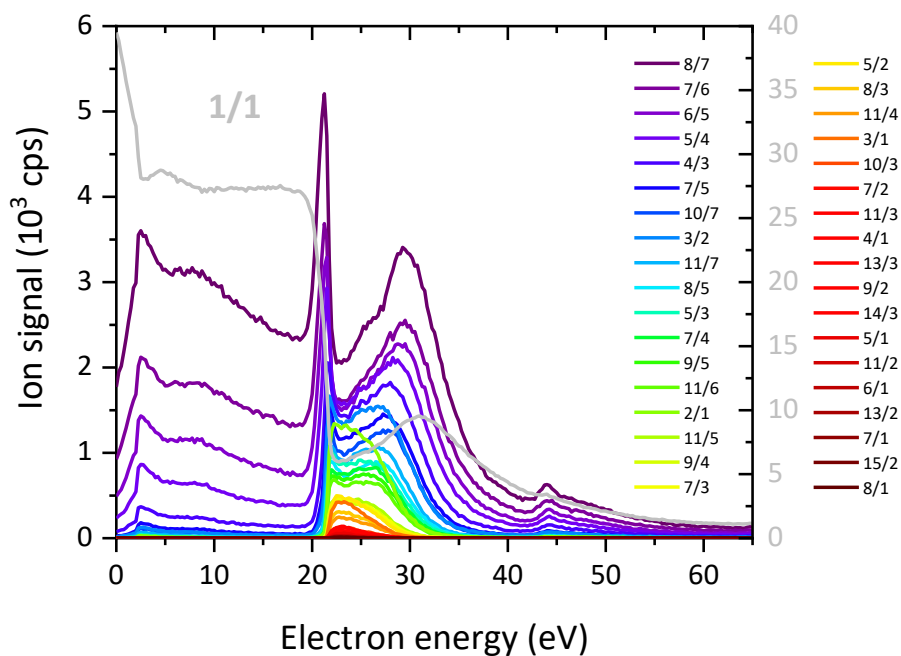


Figure S3. Ion efficiency curves for electron capture of positively charged He droplets with a mass per charge ratio of 2.7 million He atoms per charge upon electron bombardment. The curves labels are sorted according to the ratio of the precursor to final charge state.

Table S3. Appearance energies (AE) for the conversion of anionic into cationic helium droplets via electron ionization obtained by the vanishing current method from the ion efficiency curves shown in Figure 11 in the main text and Figure and S4. All appearance energies listed possess an error of ± 1 eV due to uncertainties in determination of the background signal.

Reaction process	AE (eV)	AE (eV)
	1.2×10^7 He/z	3.2×10^7 He/z
-1 \rightarrow +1	20.2	19.7
-1 \rightarrow +2	21.5	21.4
-1 \rightarrow +3	23.0	22.7
-1 \rightarrow +4	24.7	24.3
-1 \rightarrow +5	25.7	25.4
-1 \rightarrow +6	26.7	26.5
-1 \rightarrow +7	28.3	28.5
-1 \rightarrow +8	29.2	29.4
-1 \rightarrow +9	31.3	
-2 \rightarrow +1	20.2	
-2 \rightarrow +3	22.8	
-2 \rightarrow +5	25.6	
-2 \rightarrow +7	28.8	
-2 \rightarrow +9	30.6	
-2 \rightarrow +11	34.5	

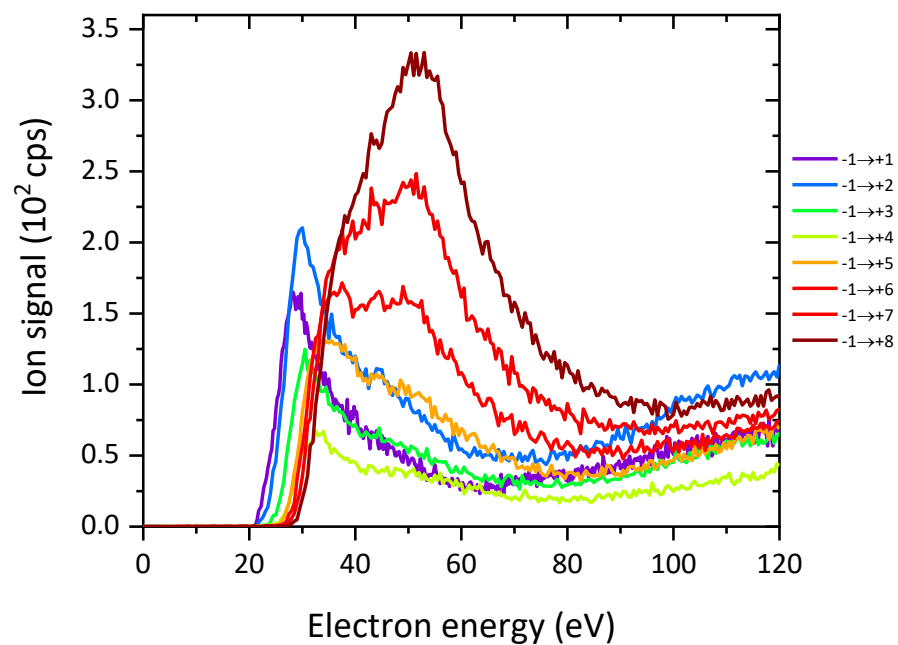


Figure S4. Ion efficiency curves for electron ionization of negatively singly charged He droplets with a mass per charge ratio of 32 million He atoms per charge. The curves are sorted according to the final charge state of the resulting positively charged droplets.