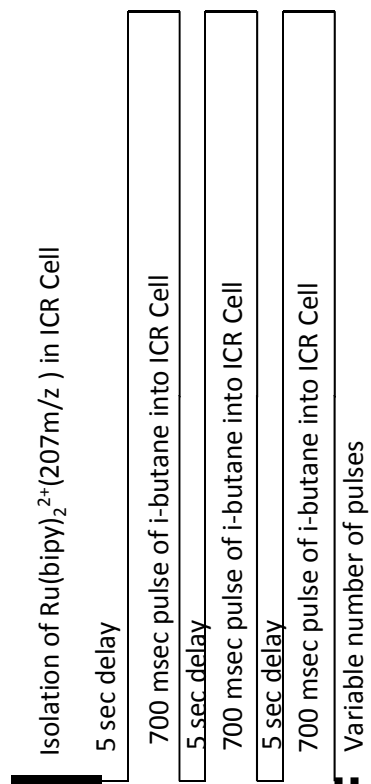
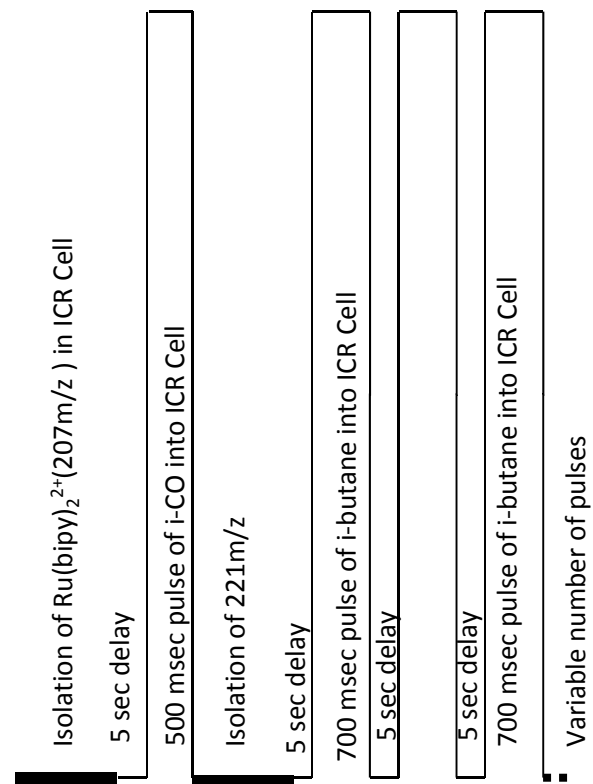


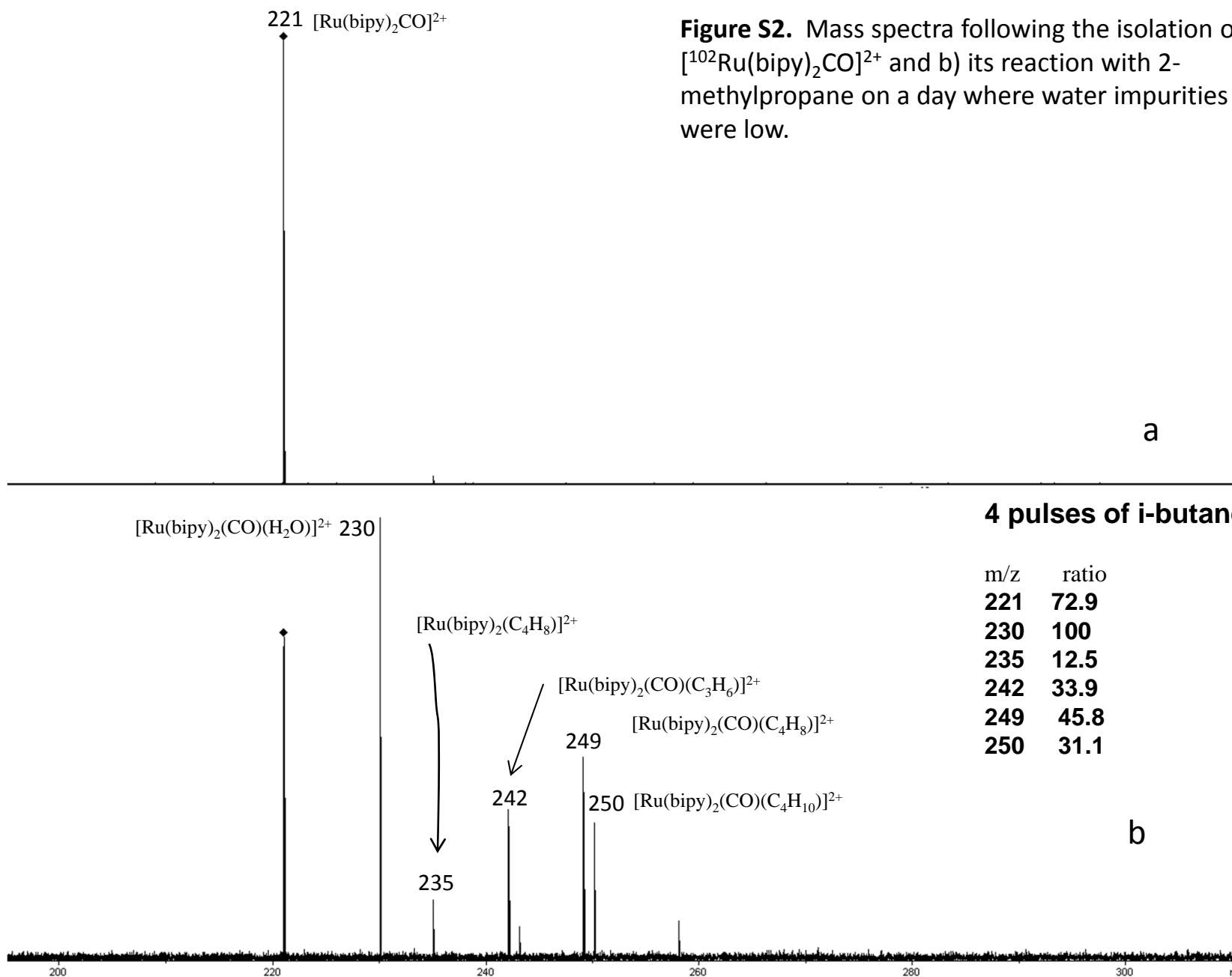
**Figure S1. a**



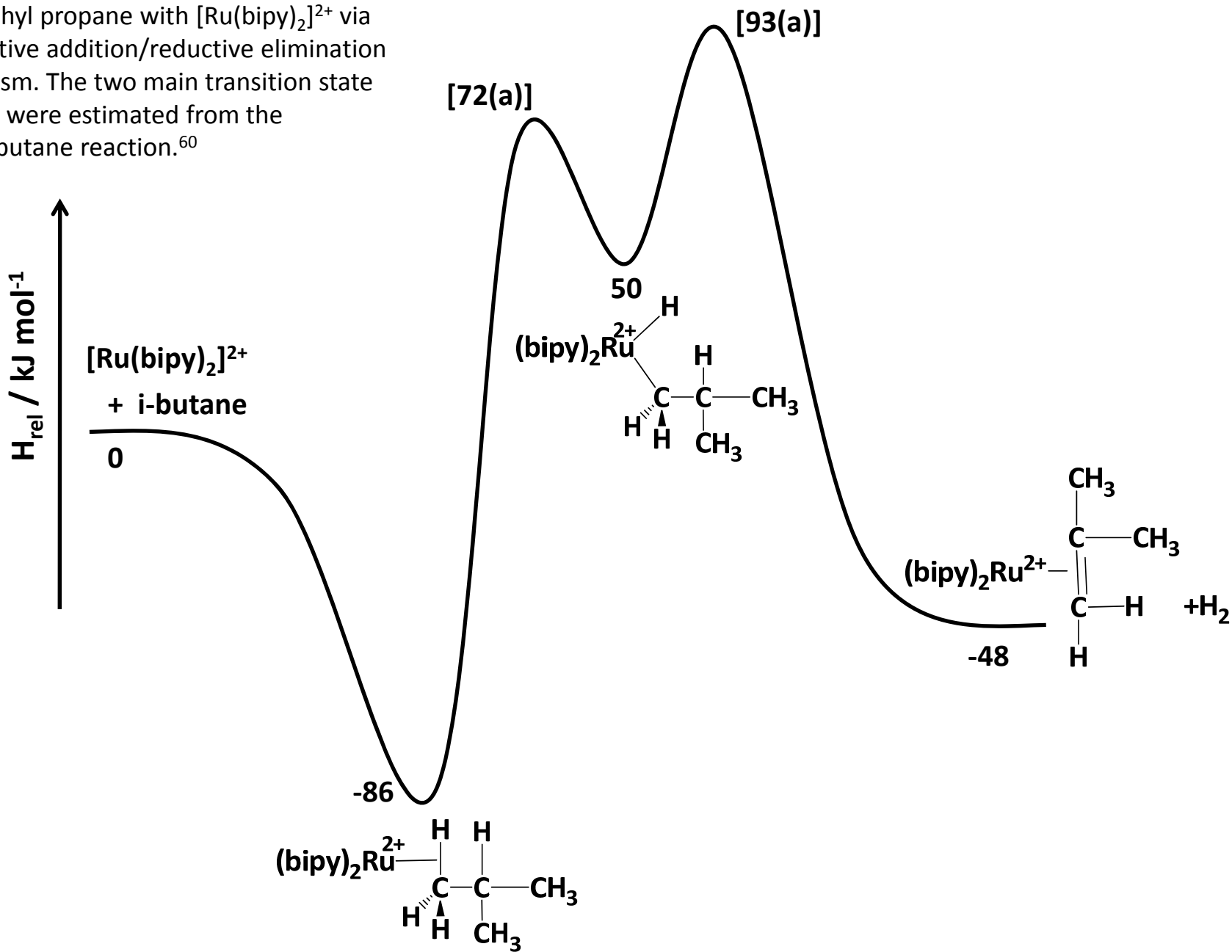
**Figure S1. b**

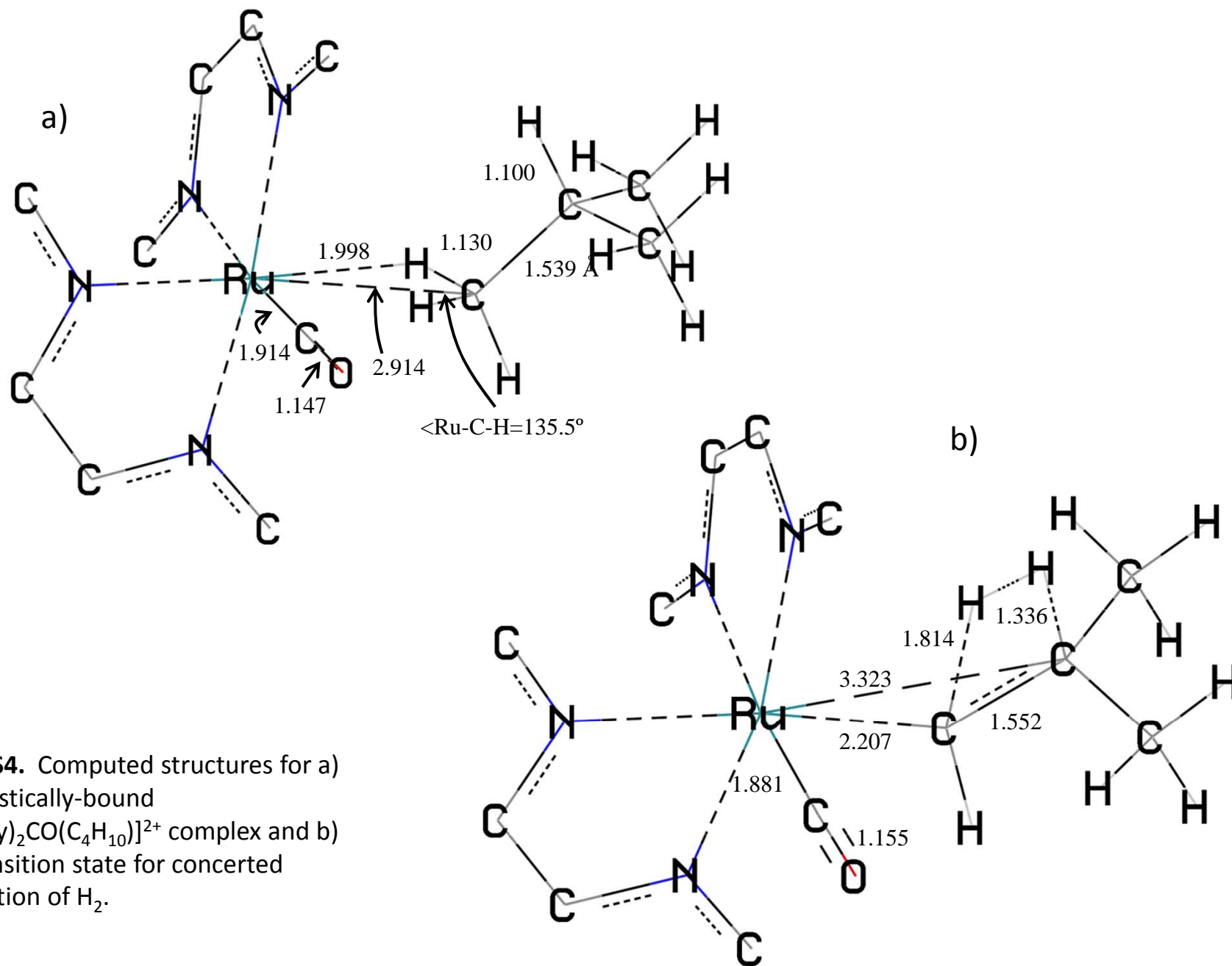


**Figure S1.** Pulse sequences for experiments conducted on the reaction of a) [Ru(bipy)<sub>2</sub>]<sup>2+</sup> and b) [Ru(bipy)<sub>2</sub>CO]<sup>2+</sup>.



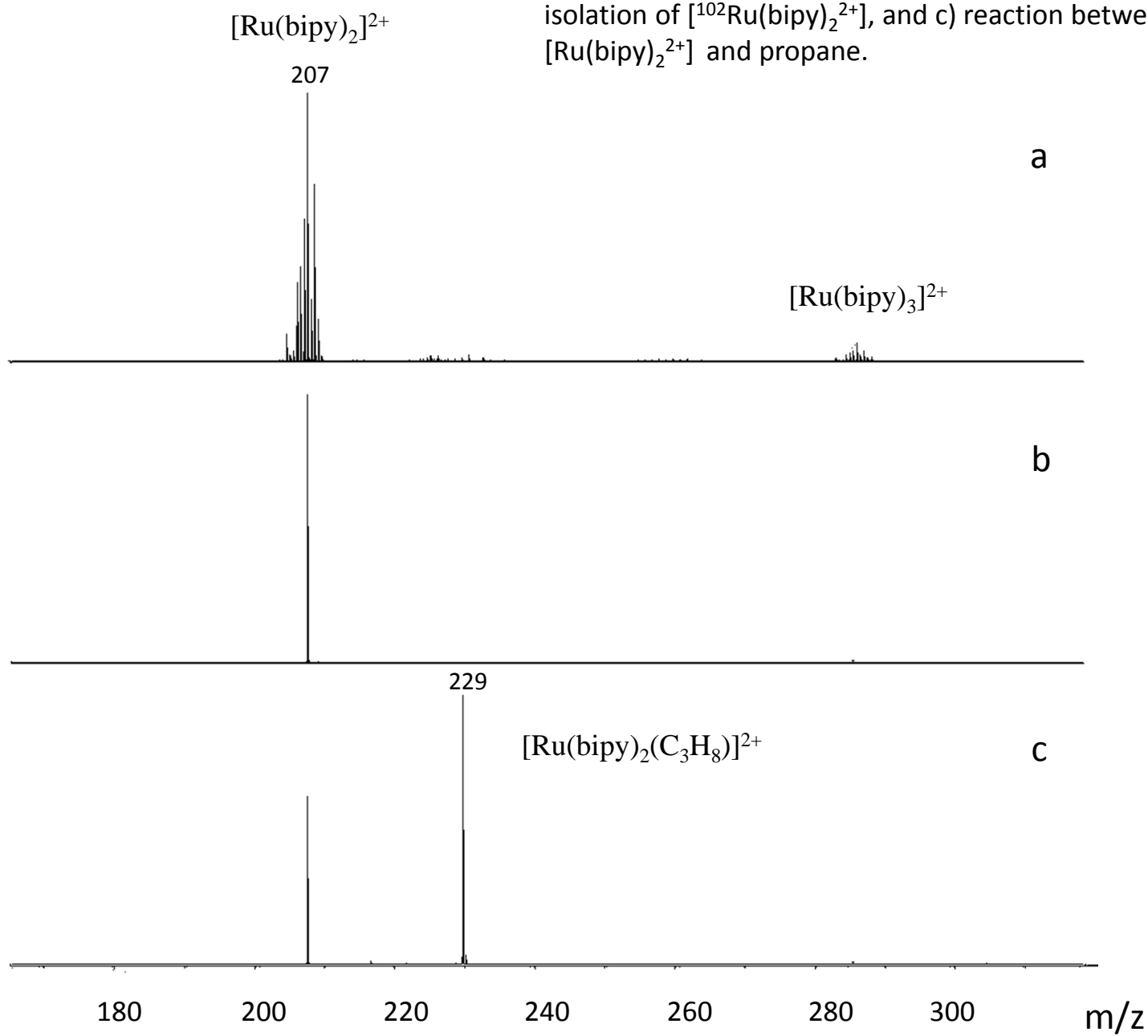
**Figure S3.** Calculated potential energy diagram for the dehydrogenation reaction of 2-methyl propane with  $[\text{Ru}(\text{bipy})_2]^{2+}$  via an oxidative addition/reductive elimination mechanism. The two main transition state energies were estimated from the  $\text{Co}^{2+}$ /isobutane reaction.<sup>60</sup>



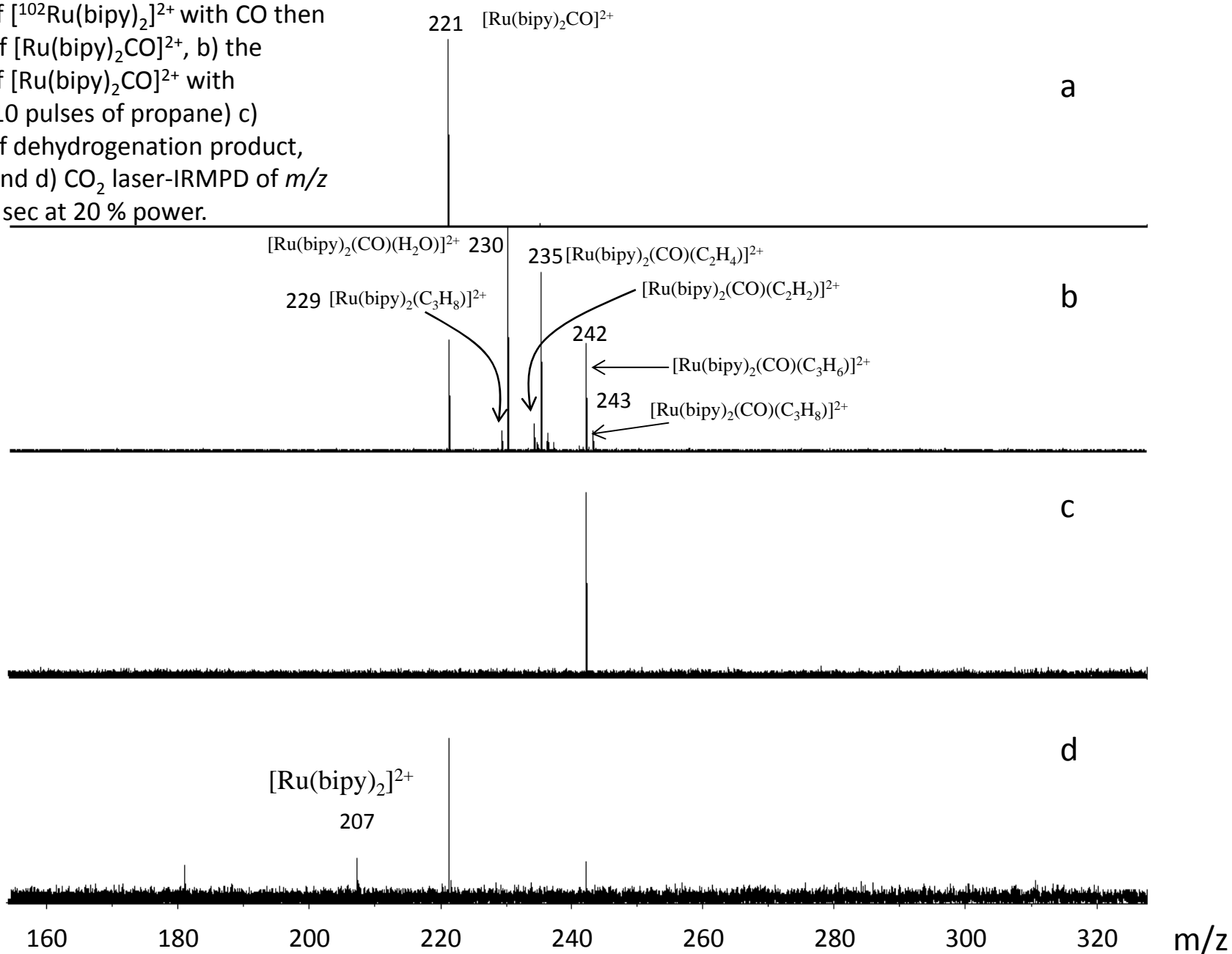


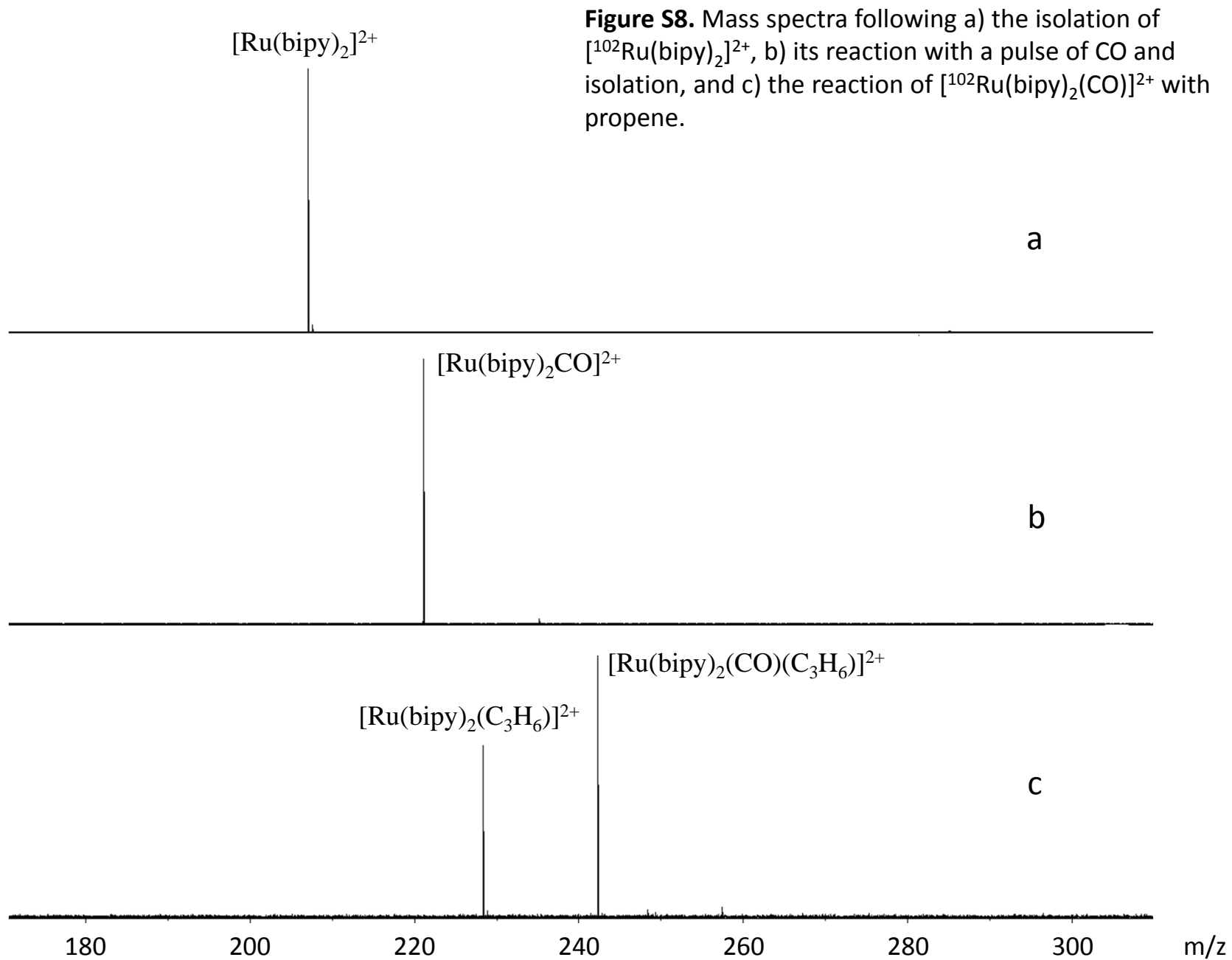


**Figure S6.** Mass spectra following a) CID of  $[\text{Ru}(\text{bipy})_3]^{2+}$  b) isolation of  $^{102}\text{Ru}(\text{bipy})_2^{2+}$ , and c) reaction between  $[\text{Ru}(\text{bipy})_2]^{2+}$  and propane.



**Figure S7.** Mass spectra following a) reaction of  $[^{102}\text{Ru}(\text{bipy})_2]^{2+}$  with CO then isolation of  $[\text{Ru}(\text{bipy})_2\text{CO}]^{2+}$ , b) the reaction of  $[\text{Ru}(\text{bipy})_2\text{CO}]^{2+}$  with propane (10 pulses of propane) c) isolation of dehydrogenation product,  $m/z$  242, and d)  $\text{CO}_2$  laser-IRMPD of  $m/z$  242 for 10 sec at 20 % power.







**Figure S9.** Computed potential energy diagram for the concerted dehydrogenation of 2-methylpropane.

