Supplemental Data

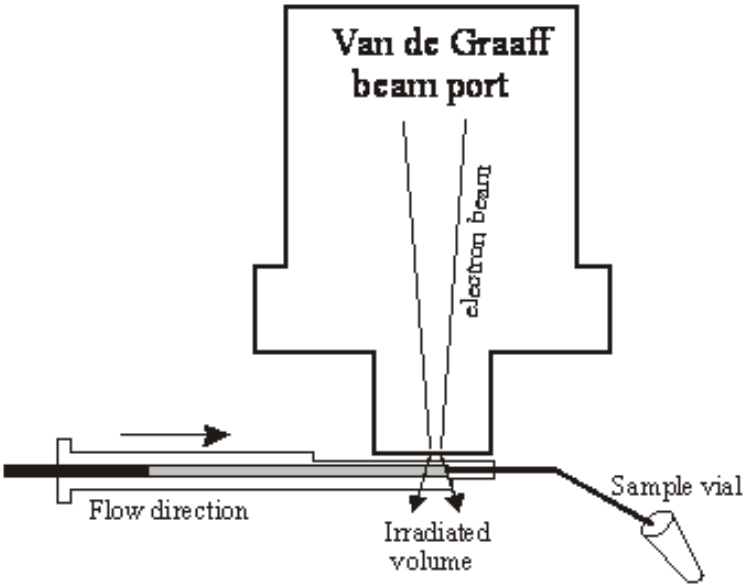
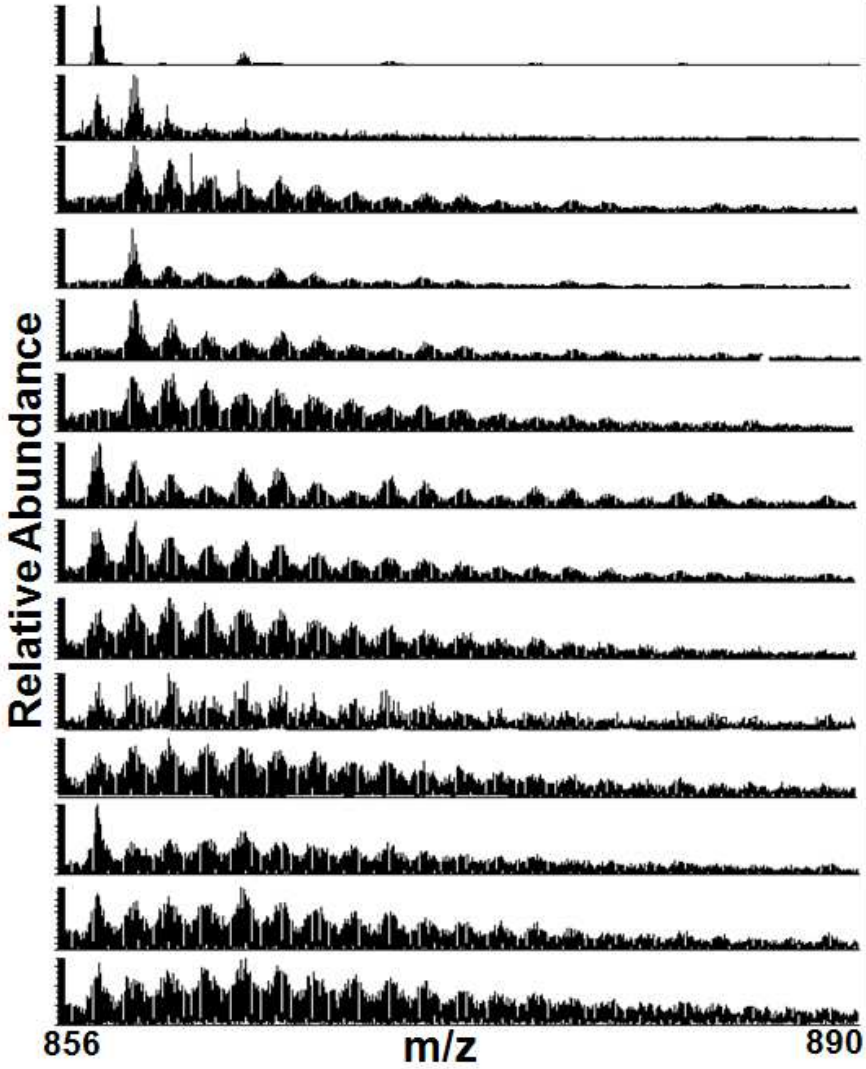


Figure S1. Schematic representation of the electron pulse protein oxidation setup.



Conditions	Pulsewidth	Heater Setting
intact	n/a	n/a
Air	400ns	13
Air	400ns	14
Air	400ns	15
Air	800ns	13
Air	800ns	14
Air + amide	800ns	13
Air + amide	800ns	14
Air + amide	800ns	15
N2O/O2 + amide	800ns	13
N2O/O2 + amide	800ns	14
N2O/O2 + amide	800ns	15
N2O/O2 + amide	400ns	14
N2O/O2 + amide	400ns	15

Figure S2. LC-MS of the 10+ charge state of intact ubiquitin**.** Phosphate adducts were seen from sodium phosphate buffer. The conditions of irradiation are listed to the right of each spectra.

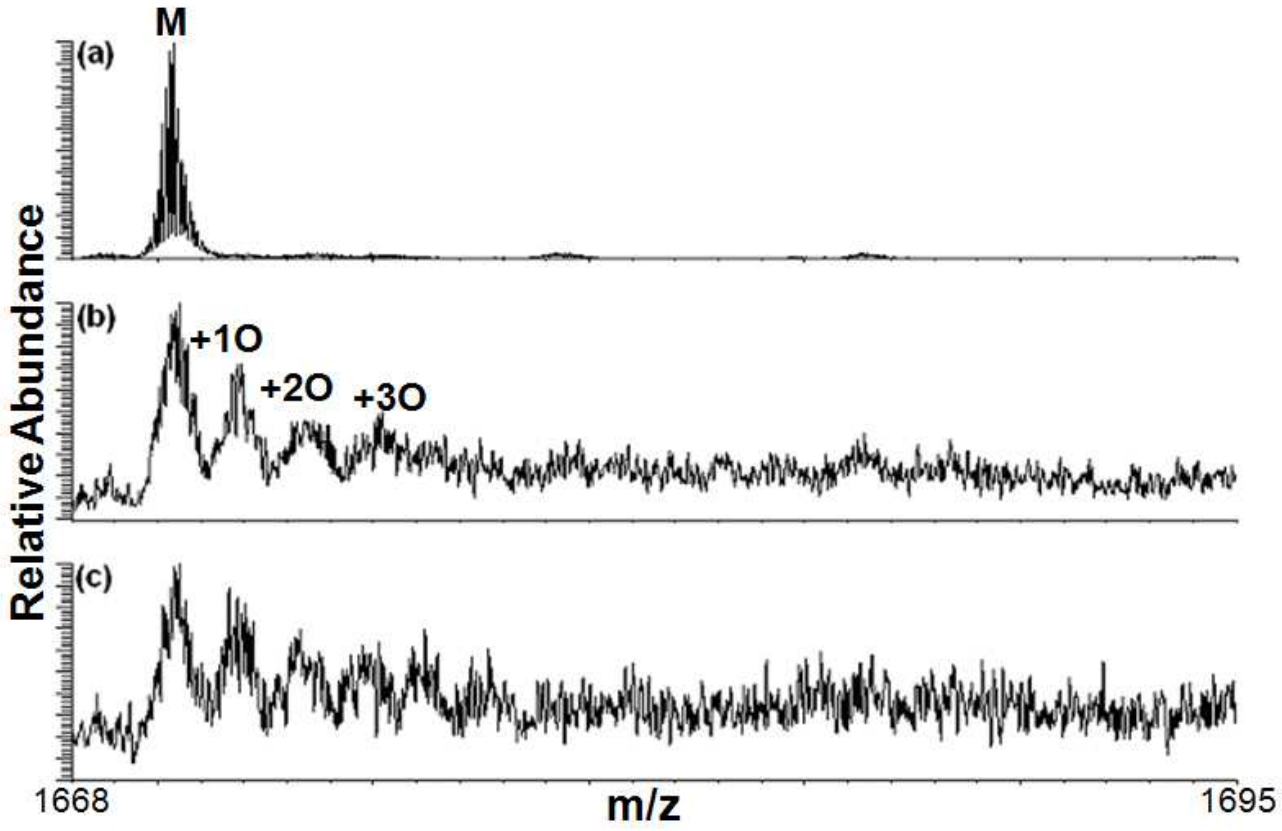


Figure S3. LC-MS of the 13+ charge state of intact β-Lactoglobulin. (a) Unirradiated ammonium phosphate buffered β-Lactoglobulin. β-Lactoglobulin was irradiated for 200 ns (b) and 400 ns (c) in air + methionine amide.

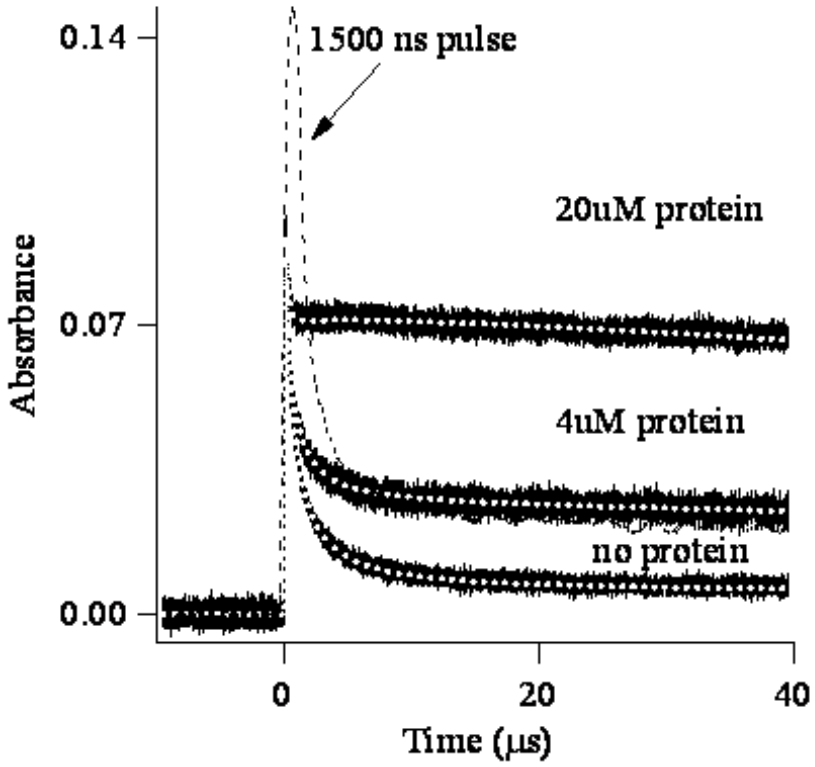


Figure S4. Transient absorption signals monitored after the pulse of electrons at 250nm. Solid lines-signals recorded after 400ns pulse; dashed line-signal recorded after 1500ns pulse; white dotted line-represents global fit of the transient absorption signals. All solutions were fixed at pH=7 with ammonium phosphate buffer and contained 25mM N_2O, the concentration of β-lactoglobulin was varied like indicated on the figure.

Table S1. Reactions and Parameters Used in the Transient Absorption Global Fitting

Reaction	Product extinction coefficient [M^{-1} cm^{-1}]	Rate constant [M^{-1} dm^{-3}]
$OH + OH \rightarrow H_2O_2$	26	5.0×10^{9}
$OH + H_2O_2 \rightarrow O_2^{-} + H_2O + H^{+}$	1890	3.7×10^{7}
$OH + H \rightarrow H_2O$	non absorbing	7.0×10^{9}
$H + H \rightarrow H_2$	non absorbing	5.0×10^{9}
$OH + PO_4^{3-} \rightarrow$ products	non absorbing	1.0×10^{5}
OH + protein → protein radical	691	1.24×10^{10}
H + protein → protein radical	691	8.7×10^{8}
protein radical → products	non absorbing	2.9×10^{3}

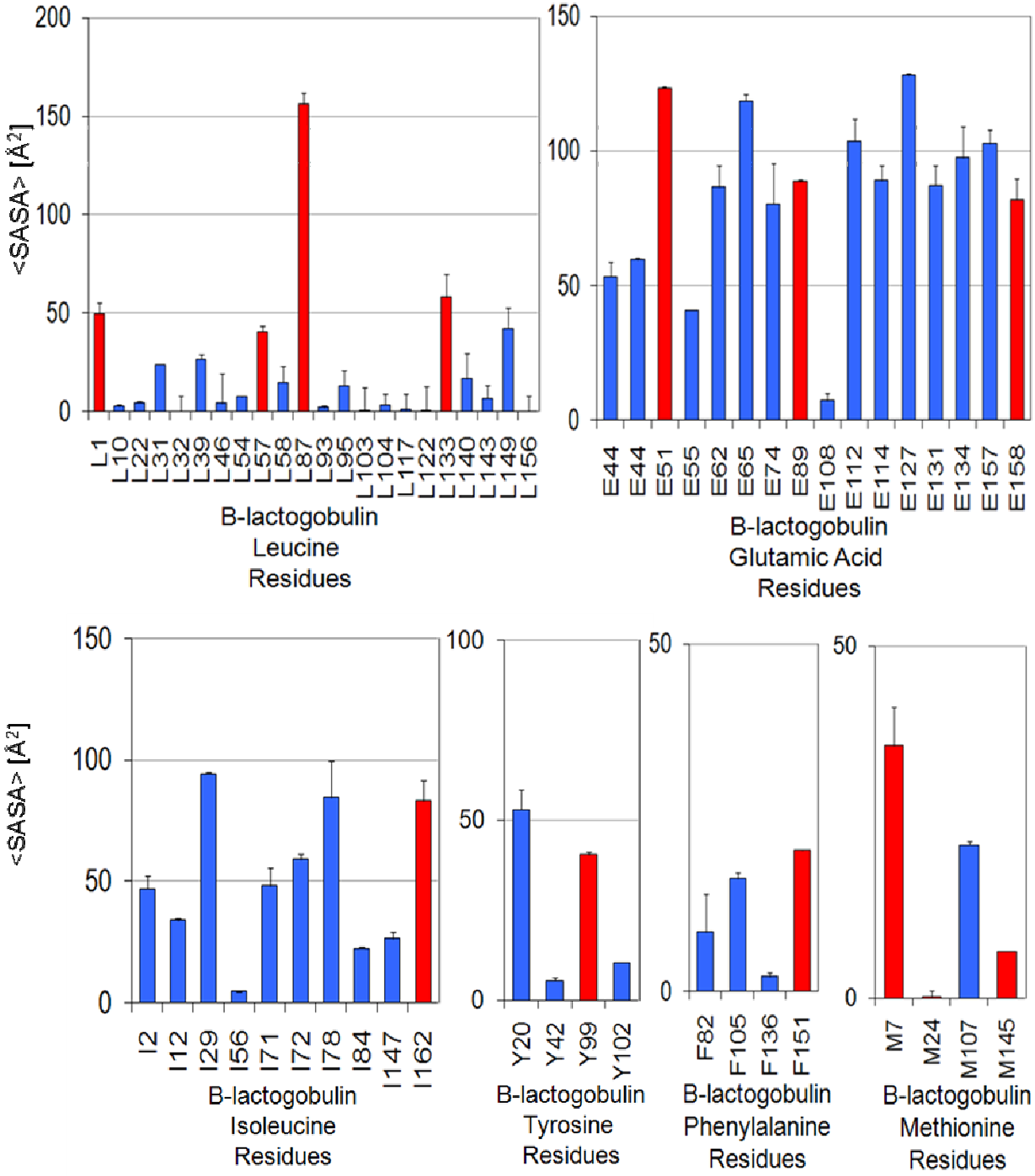


Figure S5. Surface average solvent accessibility (<SASA>) value for the amino acid groups of β-lactoglobulin that contained at least one oxidized residue. The oxidized residues are colored red.