Supplementary material

The properties of proteins and nanoparticles surface and size control the balance of forces driving protein adsorption.

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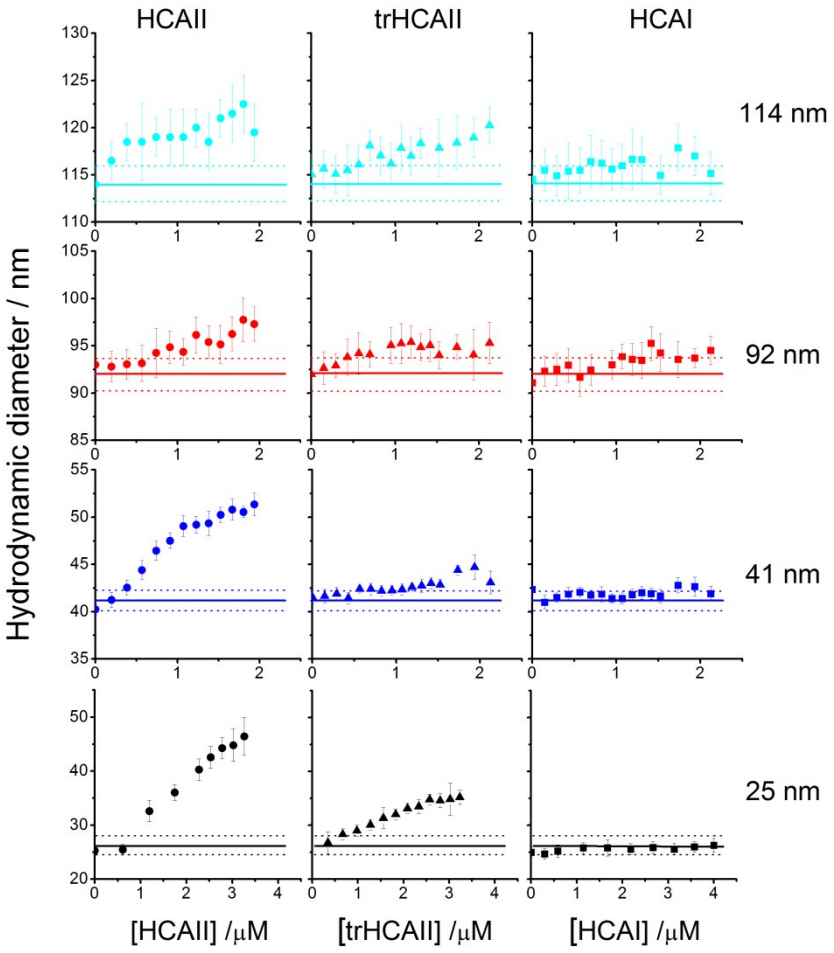

Figure S1: Hydrodynamic diameter after sequential addition of HCAII, trHCAII and HCAI to PSCOOH nanoparticles. 114 nm (cyan), 92 nm (red), 41 nm (blue) and 25 nm (black) at pH 7.4. The hydrodynamic diameter of each of the particles in buffer is indicated as a solid line (dotted lines shows the error interval for the control measurement)

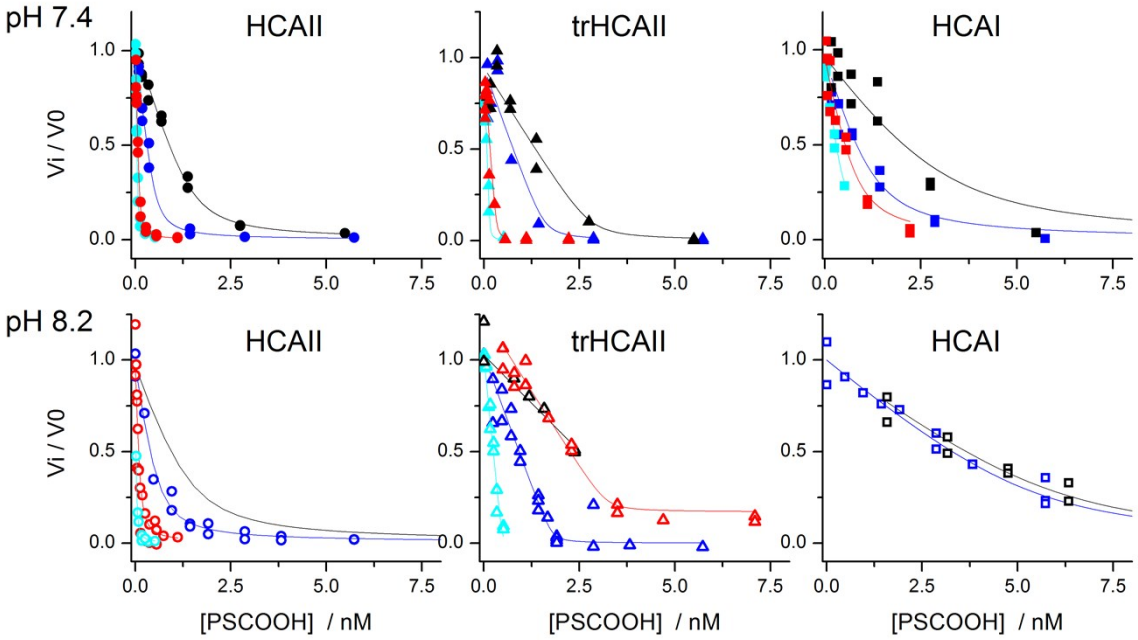

Figure S2. Activity of HCAII, trHCAII and HCAI in the presence of PSCOOH nanoparticles of different sizes: black) 25 nm, blue) 41nm, red) 92 nm and cyan) 114 nm as at two different pH (as indicated in the graph). Solid lines indicate the best fit to equation 1.

Table S1. Number of binding sites n and apparent dissociation constant for the HCA variants at different pH extracted from activity measurements

	HCAII		**trHCAII**		**HCAI**	
	pH 7.4	**pH 8.2**	**pH 7.4**	**pH 8.2**	**pH 7.4**	**pH 8.2**
25 nm	240 ± 20	260 ± 30	125±15	72±7	115 ± 35	58 ± 6
41 nm	690 ± 60	615 ± 75	220±35	196±10	300 ± 90	65 ± 6
92 nm	3250 ± 280	2750 ± 350	1060±140	685±40	450 ± 140	
114 nm	5300 ± 460	11500±5000[§]	2270±260	726±42	800 ± 230	
K_{iapp} (M)	$3 \pm 1 \cdot 10^{-8}$	$8 \pm 2 \cdot 10^{-8}$	$<0.5 \cdot 10^{-8}$	$<0.1 \cdot 10^{-8}$	$6 \pm 5 \cdot 10^{-8}$	$4 \pm 2 \cdot 10^{-8}$

[§] Trend outlier

Table S2. Number of binding sites n for the HCA variants extracted from ITC experiments for 25 nm PSCOOH particles

	HCAII	**HCAI**
pH 6.8	221± 80	160 ± 20
pH 7.4	182 ± 80	84 ± 9
pH 8.2	171 ± 50	66 ± 8

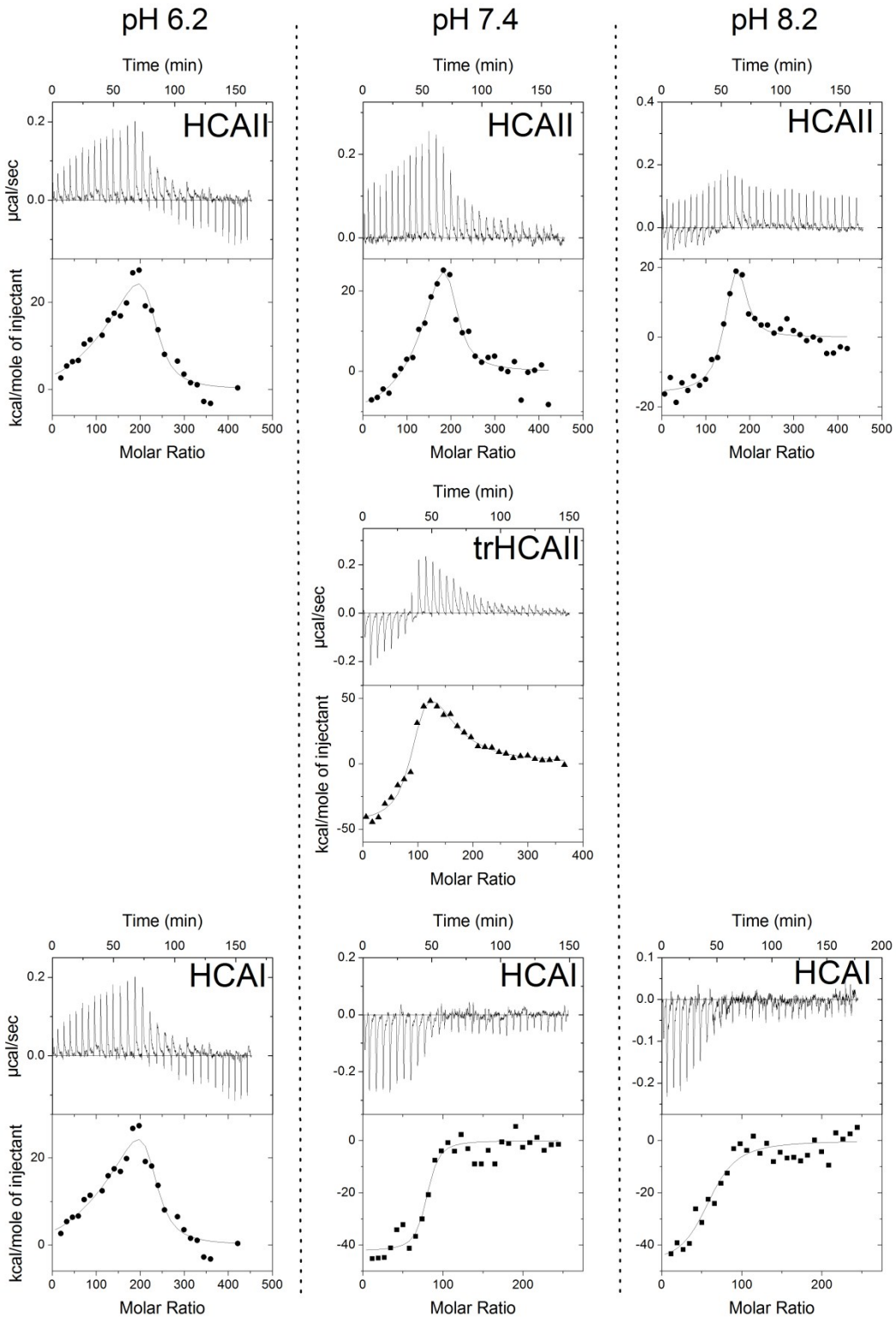

Figure S3: ITC data for the titration of CA variants to 25 nm PS nanoparticles in 10 mM HEPES/NaOH buffer at 30°C at three different pH values (see figure). Upper panels show heat evolution. The lower panels show the integrated heats after blanks correction. Solid lines in lower panels indicate the best fit for a “one set of identical sites” or “two sets of independent sites” model.

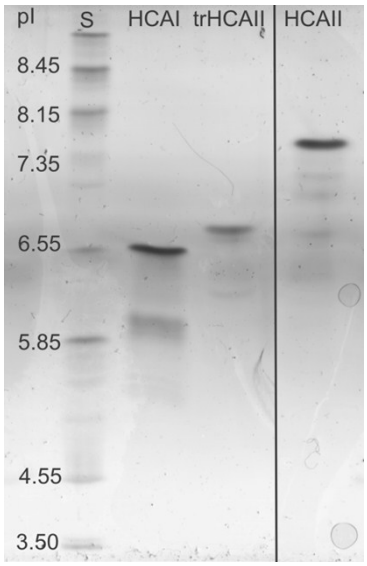

Figure S4: Isoelectric focusing gel for the three carbonic anhydrase variants. Standard for pI values is shown in lane S.