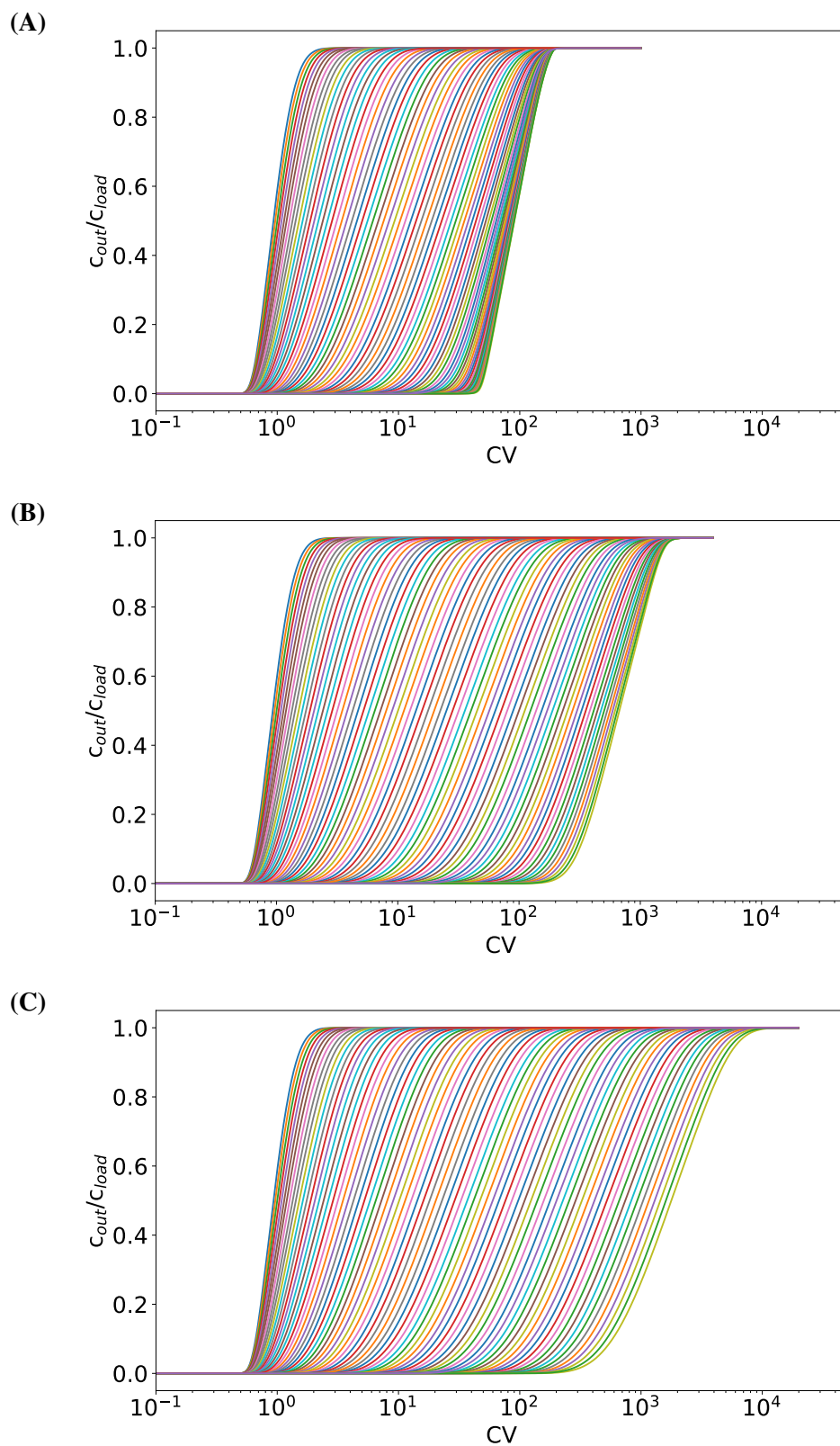


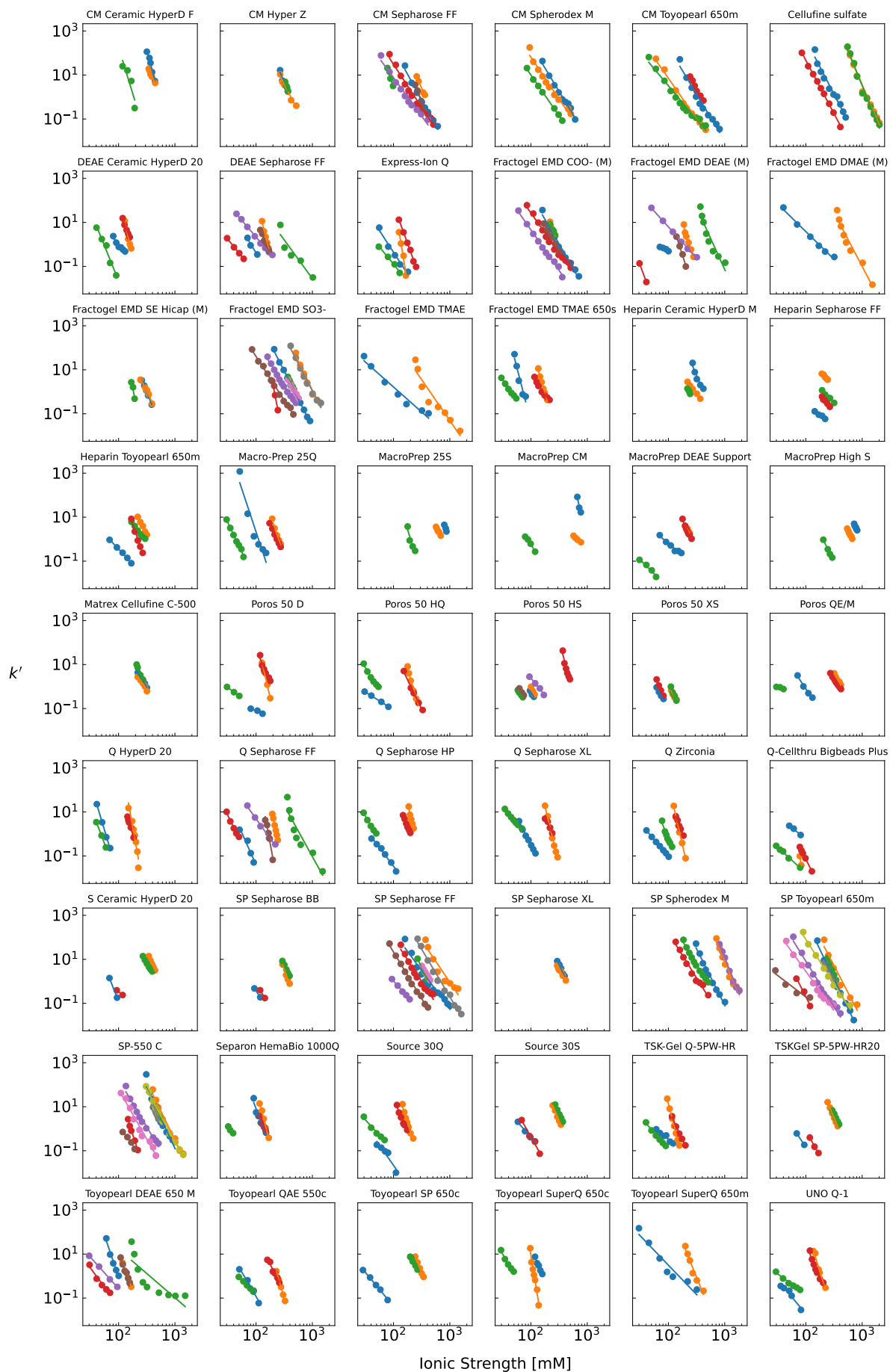
Supplementary material

**Behavior of weakly adsorbing protein impurities in  
flow-through ion-exchange chromatography**

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**Figure S1:** Breakthrough profiles from a simulation of solute loading at (A) 1 mg/ml, (B) 100  $\mu\text{g/ml}$ , and (C) 10  $\mu\text{g/ml}$ . Lines correspond to simulations with different  $K_{eq}$ , which increases by 4 orders of magnitude from left to right. Note that  $q_{max}$  was fixed at 100 mg/ml of packed column for all simulations, and the abscissa is on a logarithmic scale.



**Figure S2:** Isocratic  $k'$  data that were consolidated from the literature. Each series represents a unique protein-pH-resin combination, and lines represent quasi-SDM fits to the data. These data, which are available in the `Supplementary_table_S2.xlsx` file, were acquired by digitizing plots (using the Engauge Digitizer software), which may introduce some error into the precise  $k'$  values.

**Table S1:** Simulation parameters.

Variable	Figures 1, 2, and S1	Figure 3
$L_{col}$ [cm]	4.2	5.0 – 20.0
$r_p$ [ $\mu\text{m}$ ]	25.0	2.5 – 100.0
$\varepsilon_c$ [ - ]	0.49	0.49
$\varepsilon_p$ [ - ]	0.40	0.40
$u$ , superficial velocity [cm/h]	300	100 – 200
$D_{ax}$ [ $\text{m}^2/\text{s}$ ]	$1.25 \times 10^{-7}$	Function of $u$
$k_{film}$ [m/s]	$1.0 \times 10^{-3}$	$1.0 \times 10^{-3}$
$D_p$ [ $\text{m}^2/\text{s}$ ]	$1.0 \times 10^{-11}$	$5.0 \times 10^{-12} - 4.0 \times 10^{-11}$
$a$ [ $\text{m}^2/\text{s}$ ] (in $D_s = aK_{eq}^b$ )	$7.76 \times 10^{-12}$	$1.66 \times 10^{-12}$
$b$ [ - ] (in $D_s = aK_{eq}^b$ )	–1.54	–0.24
$K_{eq}$ [ - ]	$1.0 - 1.0 \times 10^4$	$1.0 - 1.0 \times 10^4$
$q_{max}$ [mg/ml column]	100	100
$c_{load}$ [mg/ml]	$1.0 \times 10^{-3} - 1.0 \times 10^1$	$1.0 \times 10^{-3}$