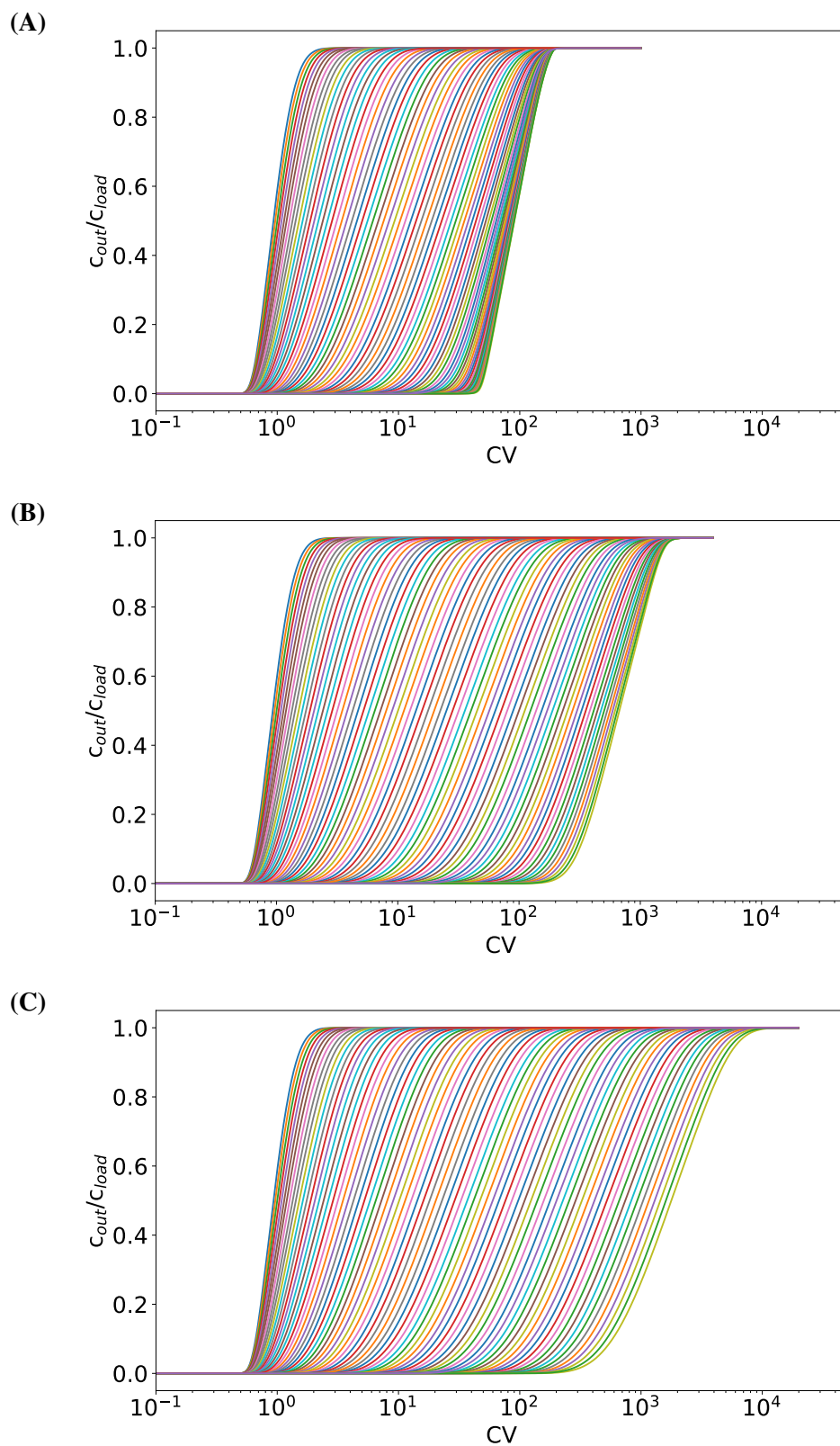


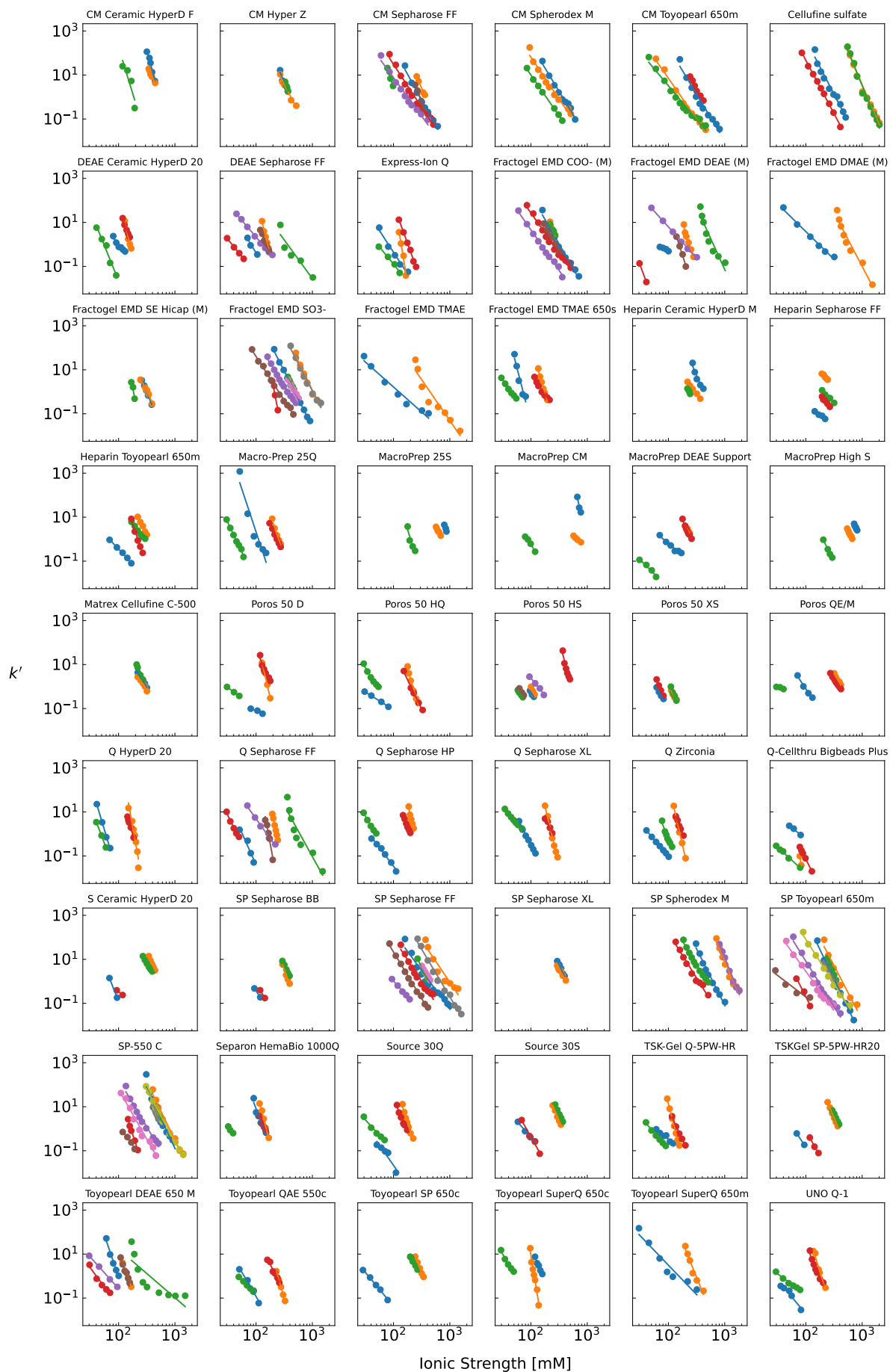
Supplementary material

**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.

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