

## Supplementary data

### Phenylboronic Acid Functionalized Adsorbents for Selective and Reversible Adsorption of Lactulose from Syrup Mixtures

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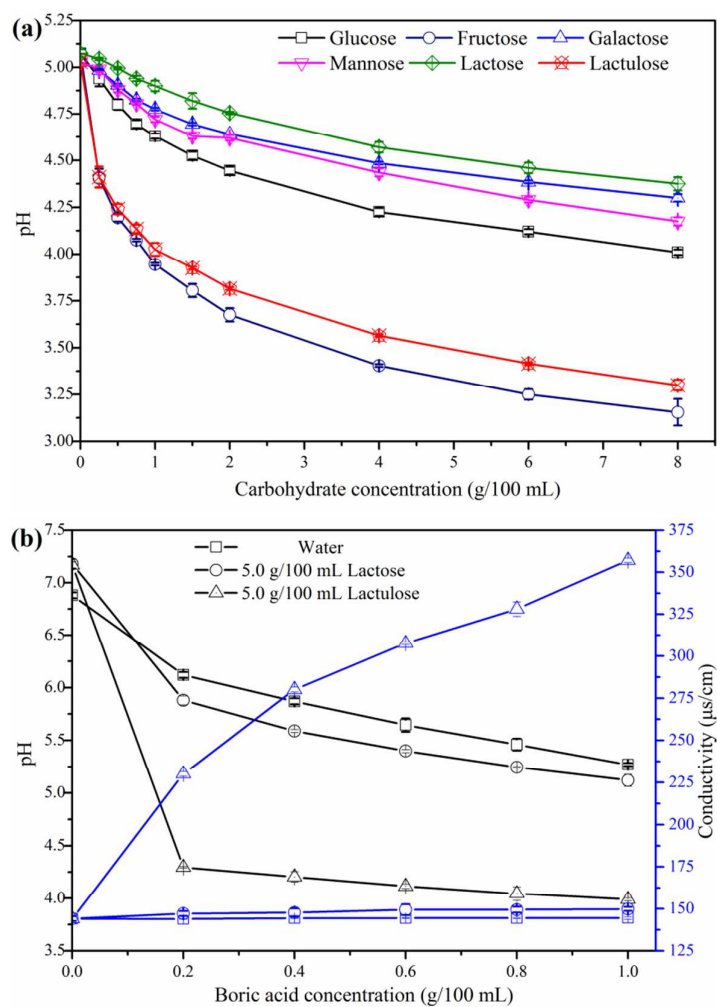
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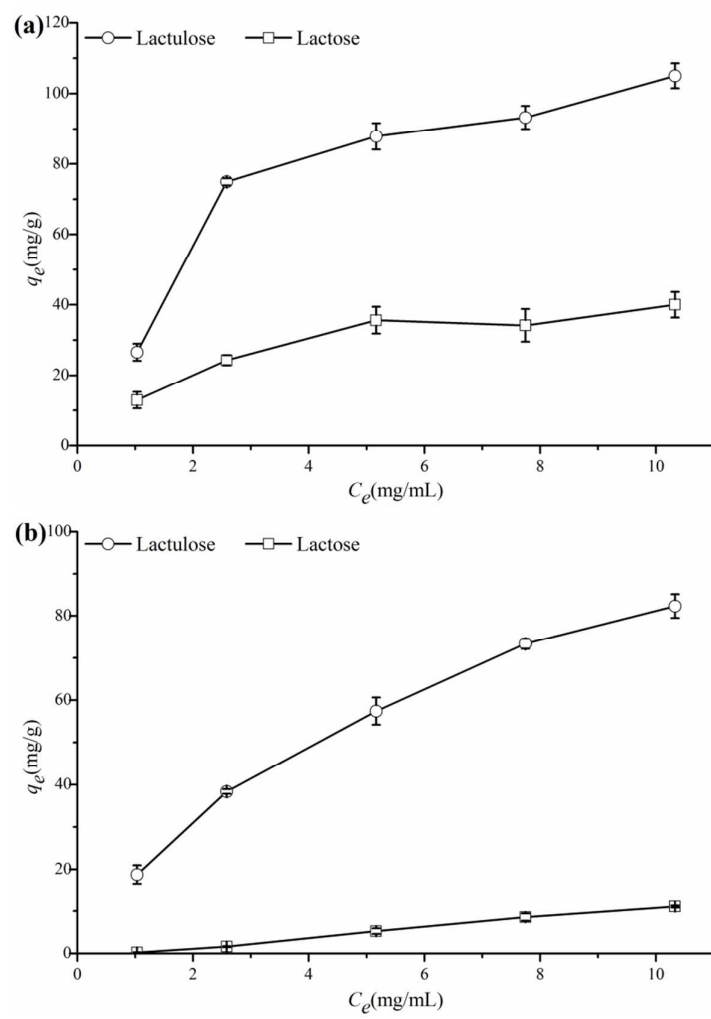
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**Fig. S1**



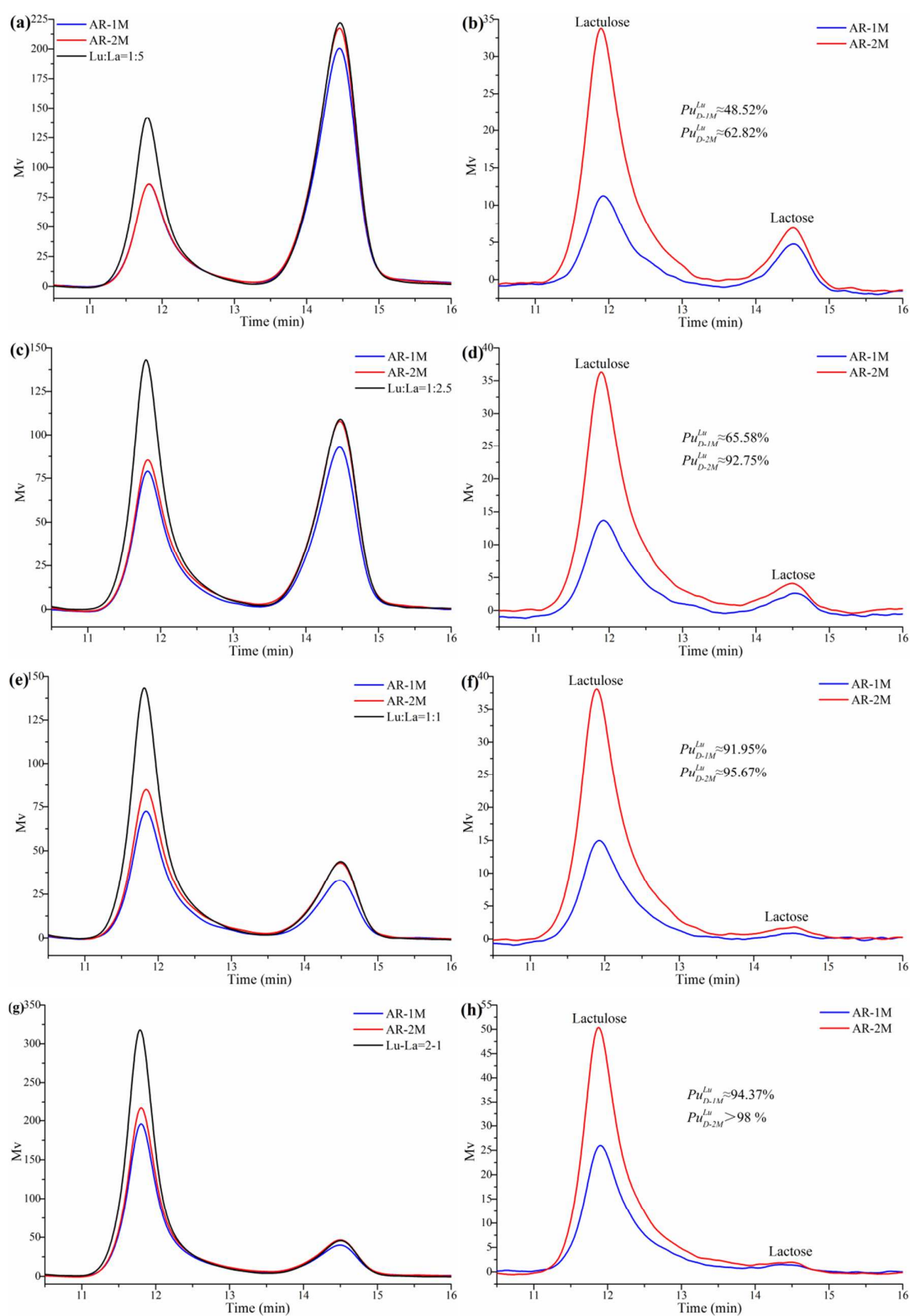
**Fig.S1.** Binding affinity difference between various sugars and boric acid. (a) Interaction of the sugar-boric acid complex with pH; (b) Influence of lactulose and lactose on boric acid dissociation in terms of pH values and solution conductivity.

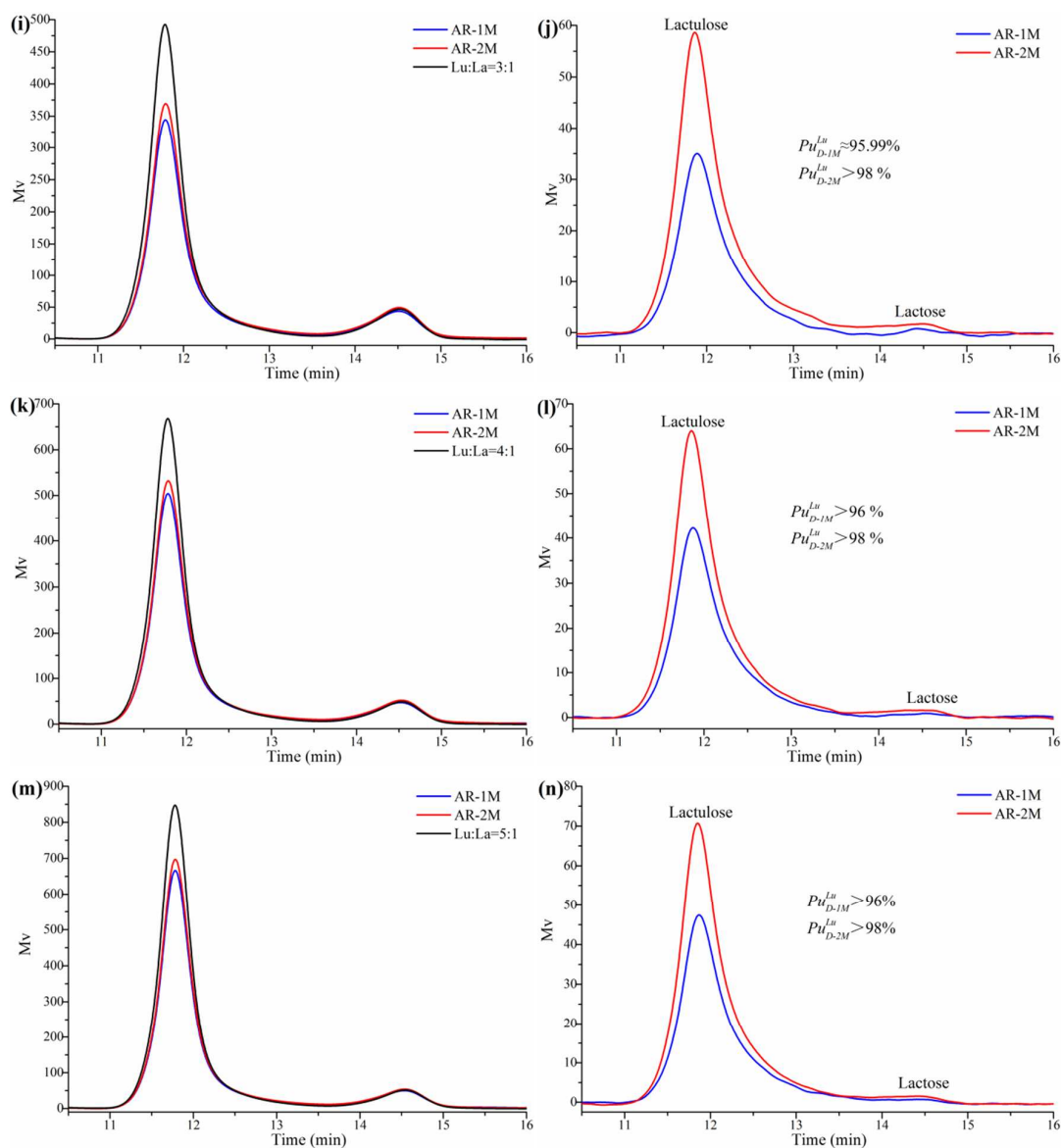
**Fig. S2**



**Fig.S2.** Adsorption isotherms of lactulose and lactose adsorbed onto AR-1M (a) and AR-2M (b) in lactulose-lactose (Lu:La=1:1) binary solution at 25°C with various sugar concentrations. Adsorption pH for AR-1M and AR-2M were fixed at pH 7.0 and pH 8.0, respectively.

**Fig. S3**



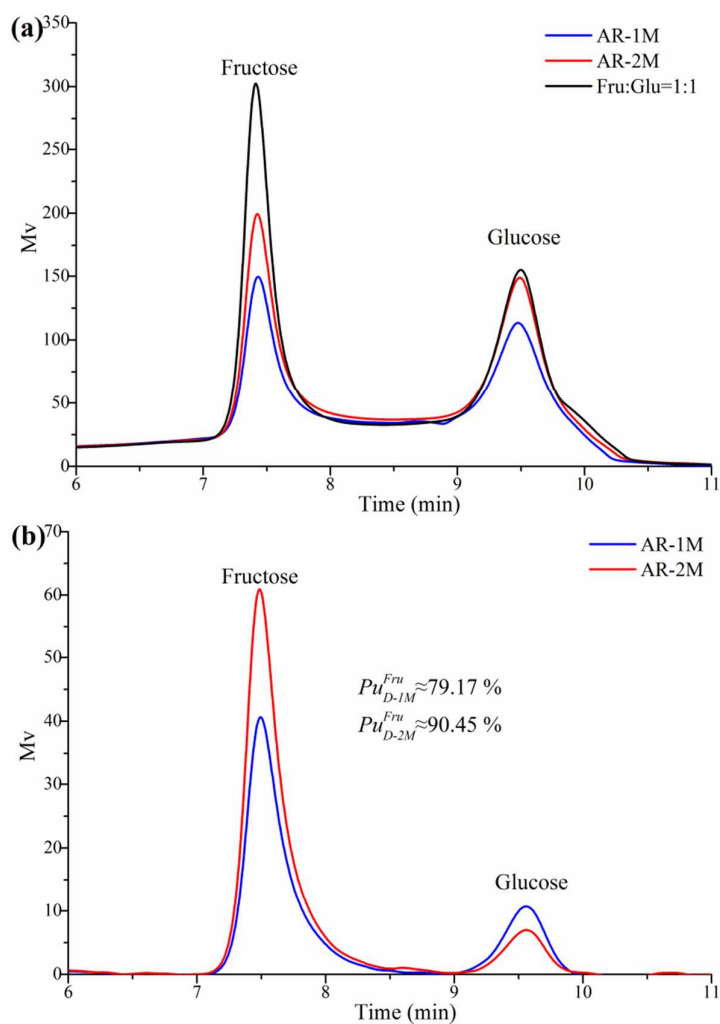


**Fig.S3.** HPLC profiles of the adsorption of lactulose and lactose on phenylboronic acid functionalization adsorbents (AR-1M: pH 7.0, 25°C; AR-2M: pH 8.0, 25°C) in lactulose-lactose binary solutions (Lu:La=1:5-5:1,  $\times 5$  mg/mL) and the desorption of lactulose and lactose from AR-1M and AR-2M at 25°C, pH 1.5.

HPLC profiles of the lactulose-lactose binary solutions after adsorption: (a) Lu:La=1:5; (c) Lu:La=1:2.5; (e) Lu:La=1:1; (g) Lu:La=2:1; (i) Lu:La=3:1; (k) Lu:La=4:1; (m) Lu:La=5:1.

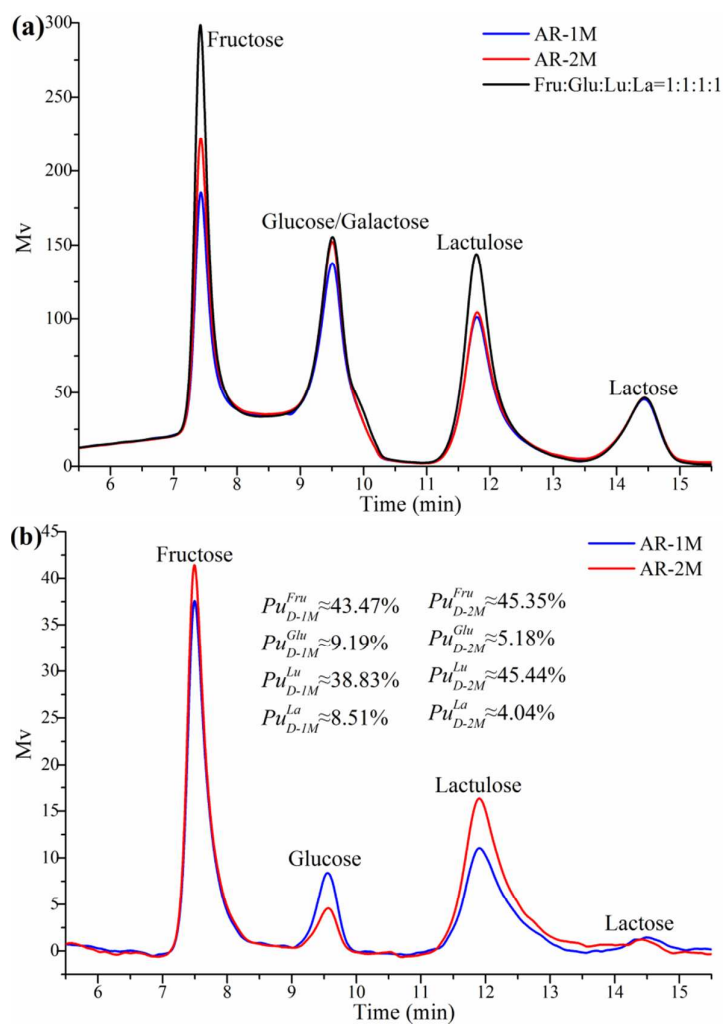
HPLC profiles of the desorption solutions from adsorbents: (b) Lu:La=1:5; (d) Lu:La=1:2.5; (f) Lu:La=1:1; (h) Lu:La=2:1; (j) Lu:La=3:1; (l) Lu:La=4:1; (n) Lu:La=5:1.

**Fig. S4**



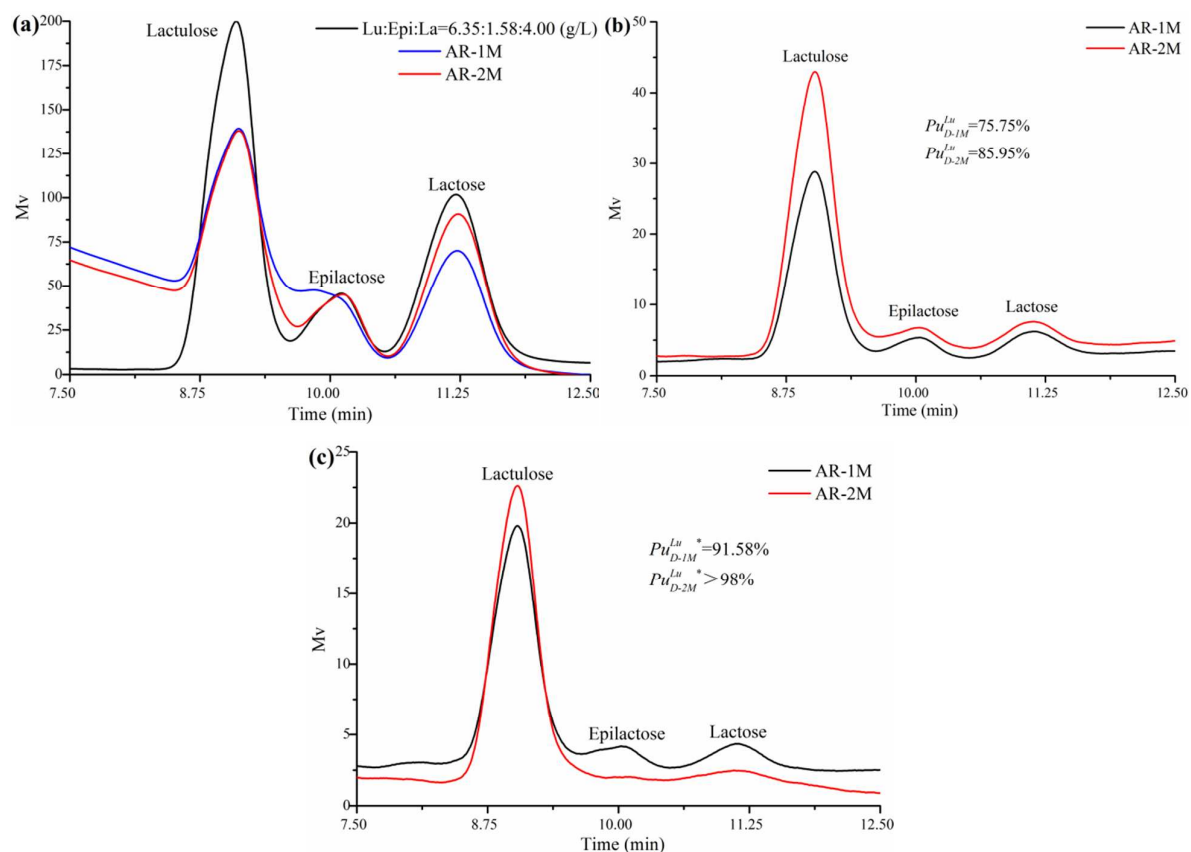
**Fig.S4.** HPLC profiles of (a) the adsorption of fructose and glucose on phenylboronic acid functionalization adsorbents (AR-1M: pH 7.0, 25°C; AR-2M: pH 8.0, 25°C) in fructose-glucose binary solutions (Fru:Glu=1:1,  $\times 5$  mg/mL) and (b) the desorption of fructose and glucose from AR-1M and AR-2M at 25°C, pH 1.5.

**Fig. S5**



**Fig.S5.** HPLC profiles of (a) the adsorption of various sugars on phenylboronic acid functionalization adsorbents (AR-1M: pH 7.0, 25°C; AR-2M: pH 8.0, 25°C) in fructose-glucose-lactulose-lactose mixture solutions (Fru:Glu:Lu:La=1:1:1:1,  $\times 5$  mg/mL) and (b) desorption of sugars from AR-1M and AR-2M at 25°C, pH 1.5.

**Fig. S6**



**Fig.S6.** HPLC profiles of (a) the adsorption of lactulose, lactose and epilactose on phenylboronic acid functionalization adsorbents (AR-1M: pH 7.0, 25°C; AR-2M: pH 8.0, 25°C) in  $CsCE$  isomerization mixtures (Lu:Epi:La=6.35:1.58:4.0,  $\times g/mL$ ); (b) the desorption of sugars from AR-1M and AR-2M at 25°C, pH 1.5 and (c) the desorption of lactulose, lactose and epilactose from AR-1M and AR-2M at 25°C, pH 1.5 after first washed with deionized water (pH 5.8~6.0).