Supporting information

Carbonated water for the separation of carboxylic compounds: a chromatography approach

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**Sample calculation**

Amine functional group density

**Supplemental figures**

Figure S-1. pH of CO$_2$ loaded water at various partial pressure

Figure S-2. SEM images of functionalized silica spheres

Figure S-3. $^{13}$C and $^{29}$Si NMR spectra and peak assignments of functionalized silica spheres

**Reference**
Amine functional group density

The density of functional groups is calculated based upon the weight percentage of nitrogen on the functionalized silica spheres. For example, in 100 g of dried primary amine functionalized silica material, there is 0.51 g of nitrogen. The amine group density in each gram of dry material is calculated as follows:

\[
N = \frac{w}{M_w} \frac{1}{100 \text{ g}}
\]

\[
= \frac{0.51 \text{ g}}{14.0 \text{ g mol}^{-1}} \frac{1}{100 \text{ g}}
\]

\[
= 0.364 \text{ mmol g}^{-1}
\]
Figure S-1. The measured pH of CO$_2$ dissolved in water produced post-pump by mixing different ratios of CO$_2$-saturated water (1 bar) and N$_2$ bubbled water; calculated pH of CO$_2$ dissolved water at different CO$_2$ partial pressure. The plot identifies the pH range accessible with a water / CO$_2$-modified solvent system. This figure is reproduced from another paper.*
Figure S-2. Representative scanning electron microscope images of silica spheres after the functionalization reaction at two different magnifications. The images are obtained from a FEI MLA 650 FEG Scanning Electron Microscopy.
Figure S-3. Solid-state NMR spectra and peak assignments. (a) $^{29}$Si NMR spectrum of tertiary amine functionalized silica. (b) $^{13}$C NMR spectrum of primary amine functionalized silica. (c) $^{13}$C NMR spectrum of secondary amine functionalized silica. (d) $^{13}$C NMR spectrum of tertiary amine functionalized silica.
Reference