Appendix A. Supplementary Data

Improved ionic-liquid-functionalized macroporous supports able to purify nucleic acids in one-step

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Preparation of silica-supported ILs: The synthesis of silica-supported ionic liquids was performed *via* a two-step procedure: 1) Covalent attachment of (3-chloropropyl)trimethoxysilane to silica gel (60, 0.2-0.5 mm) (Merck, Darmstadt, Germany). The starting silica (5g) was immersed in hydrochloric acid, washed with double distilled water, dried under vacuum at 105 °C, and suspended in 60 mL of toluene. Then, 5 mL of chloropropyl)trimethoxysilane were added and the suspension was kept in reflux under mechanical agitation (550 rpm). After 24 h, the suspension was cooled down to room temperature, filtered and washed with distinct solvents, namely toluene, ethanol-water (1:1), distilled water and methanol. This material was subsequently vacuum-dried at 60 °C for 24 h, thereby yielding silica with the spacer arm (SilPrCl); 2) Reaction of SilPrCl with triethylamine, dimethylbutylamine, trioctylamine and 1-methylimidazole, aiming to obtain silica functionalized with ILs triethylpropylammonium chloride ($SilPrNEt_3Cl$), butyldimethylpropylammonium chloride ($SilPrNMe_3BuCl$), trioctylpropylammonium chloride ($SilPrNOct_3Cl$) and 1-methyl-3- propylimidazolium chloride (SilPrMImCl), respectively. These reactions were separately carried out by adding 5 mL of either triethylamine, dimethylbutylamine, trioctylamine or 1-methylimidazole to 5 g of SilPrCl, refluxed during 24 h at 550 rpm, and were further recovered by filtration and washed with ethanol, distilled water and methanol. Silicas materials functionalized with each IL were finally dried at 60 °C. The corresponding chemical structures of the ILs supported in silica are shown in **Figure S1**.

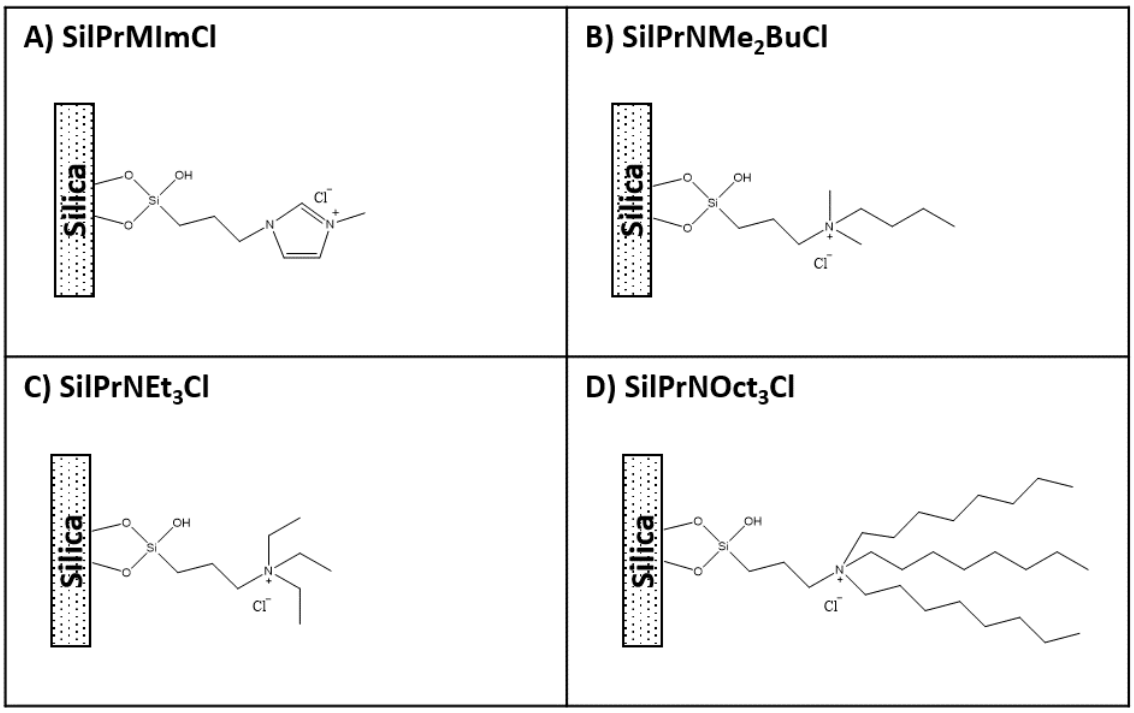

Figure S1. Chemical structures of ILs supported in silica. **A)** 1-methyl-3- propylimidazolium chloride, SilPrMImCl; **B)** triethylpropylammonium chloride, $SilPrNEt_3Cl$; **3)** butyldimethylpropylammonium chloride, $SilPrNMe_3BuCl$; **4)** trioctylpropylammonium chloride, $SilPrNOct_3Cl$.

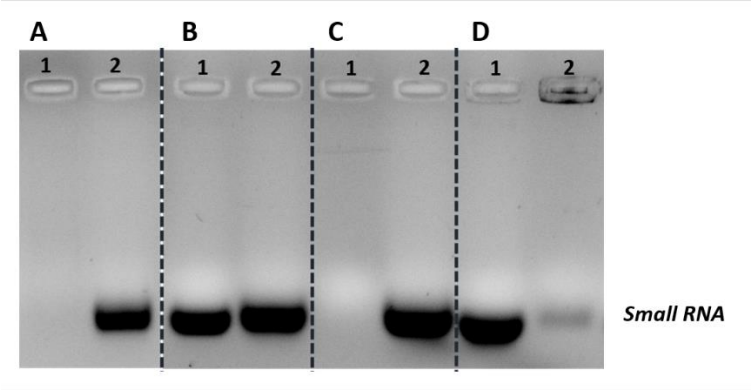

Figure S2. Agarose gel electrophoretic analysis of small RNA from *E. coli* loaded onto IL-functionalized silica supports. (**A)** 1-methyl-3- propylimidazolium chloride, SilPrMImCl; **B)** triethylpropylammonium chloride, $SilPrNEt_3Cl$; **C)** butyldimethylpropylammonium chloride, $SilPrNMe_3BuCl$; **D)** trioctylpropylammonium chloride, $SilPrNOct_3Cl$. Lane 1: small RNA binding fraction with 10 mM Tris-HCl, pH 8.0; Lane 2: small RNA elution with 2 M NaCl in 10 mM Tris-HCl, pH 8.0.

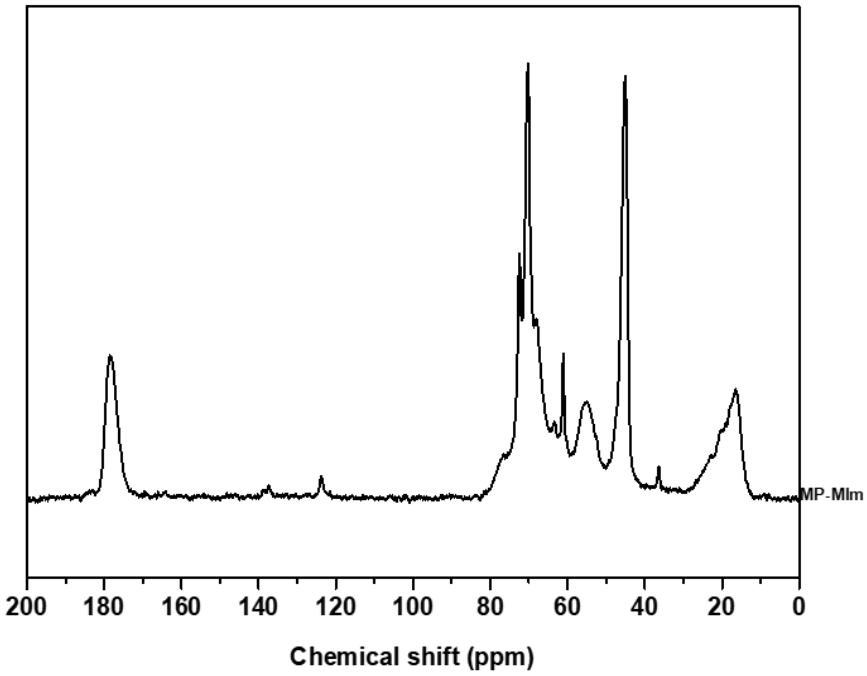

Figure S3. ^{13}C CP-MAS NMR spectra of MP-MIm support.

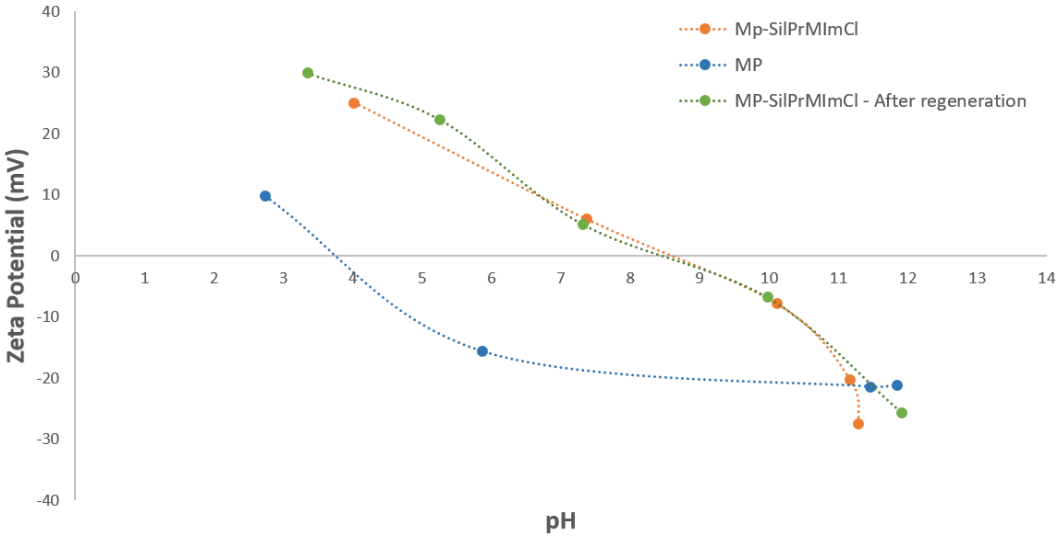

Figure S4. Zeta potential measurements at different pH (adjusted with 0.1 M NaOH, and 0.1 M HCl) of suspensions of the non-functionalized MP support (blue), the functionalized MP-SilPrMImCl support before (orange) and after regeneration (green).

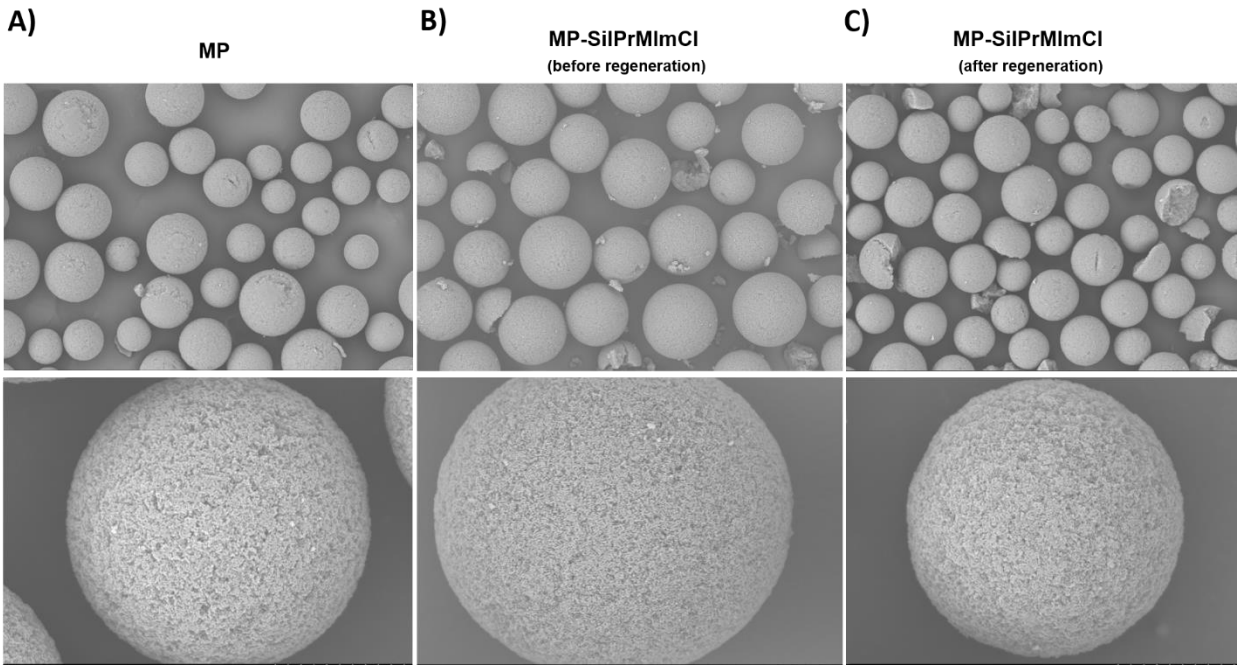

Figure S5. Scanning electron microscopy images of non-functionalized MP support **(A)**, functionalized MP-SilPrMImCl support **(B)**, and functionalized MP-SilPrMImCl support after a regeneration process that includes consecutive washes with NaOH, HCl, and distilled water **(C)**.

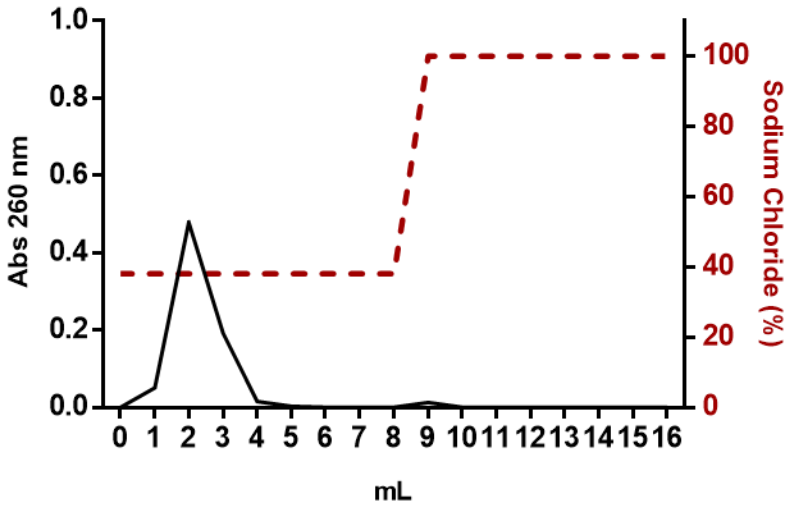

Figure S6. Chromatographic profile of a small RNA sample loaded onto the MP-MIm support. Experiments were performed in disposable polypropylene columns using a stepwise gradient based on the increase of NaCl concentration from 0.4 to 1 M (in 10 mM Tris, pH 8), as represented by the red line.

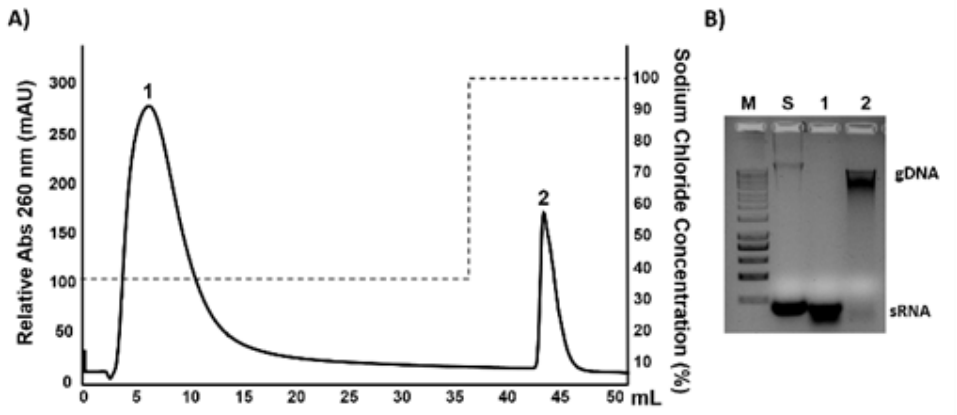

Figure S7. A) Chromatographic profile of the separation of small RNA from genomic DNA with the MP-SilPrMImCl support. Elution was performed at 1 mL/min by an increasing the NaCl concentration (in 10 mM Tris-HCl, pH 8) in a stepwise mode, represented by the dashed line. **B)** Agarose gel electrophoresis of the different fractions recovered in the chromatographic assay performed in MP-SilPrMImCl support. M - Nucleic acids molecular weight marker; S - Initial bacterial lysate sample; 1 and 2 - Chromatographic peaks 1 and 2, respectively.

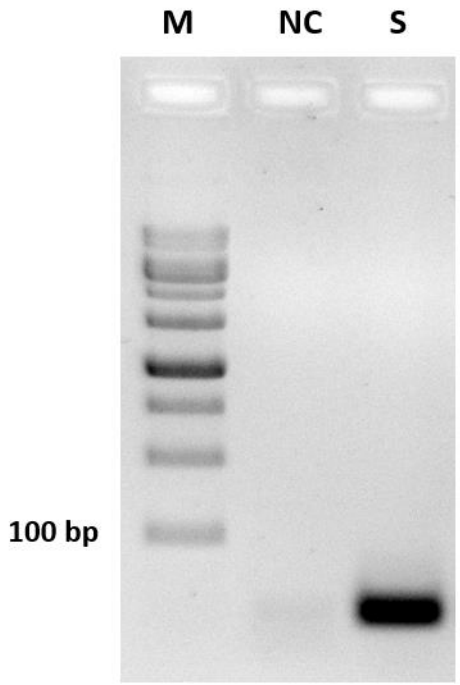

Figure S8. Agarose gel electrophoresis of PCR products using complementary DNA synthesized from the sample recovered with 0.5 M NaCl (S); NC represents the negative control reaction.