

## Supporting information

# Functional Integration of DNA Purification and Concentration Into Real Time Micro-PCR Chip

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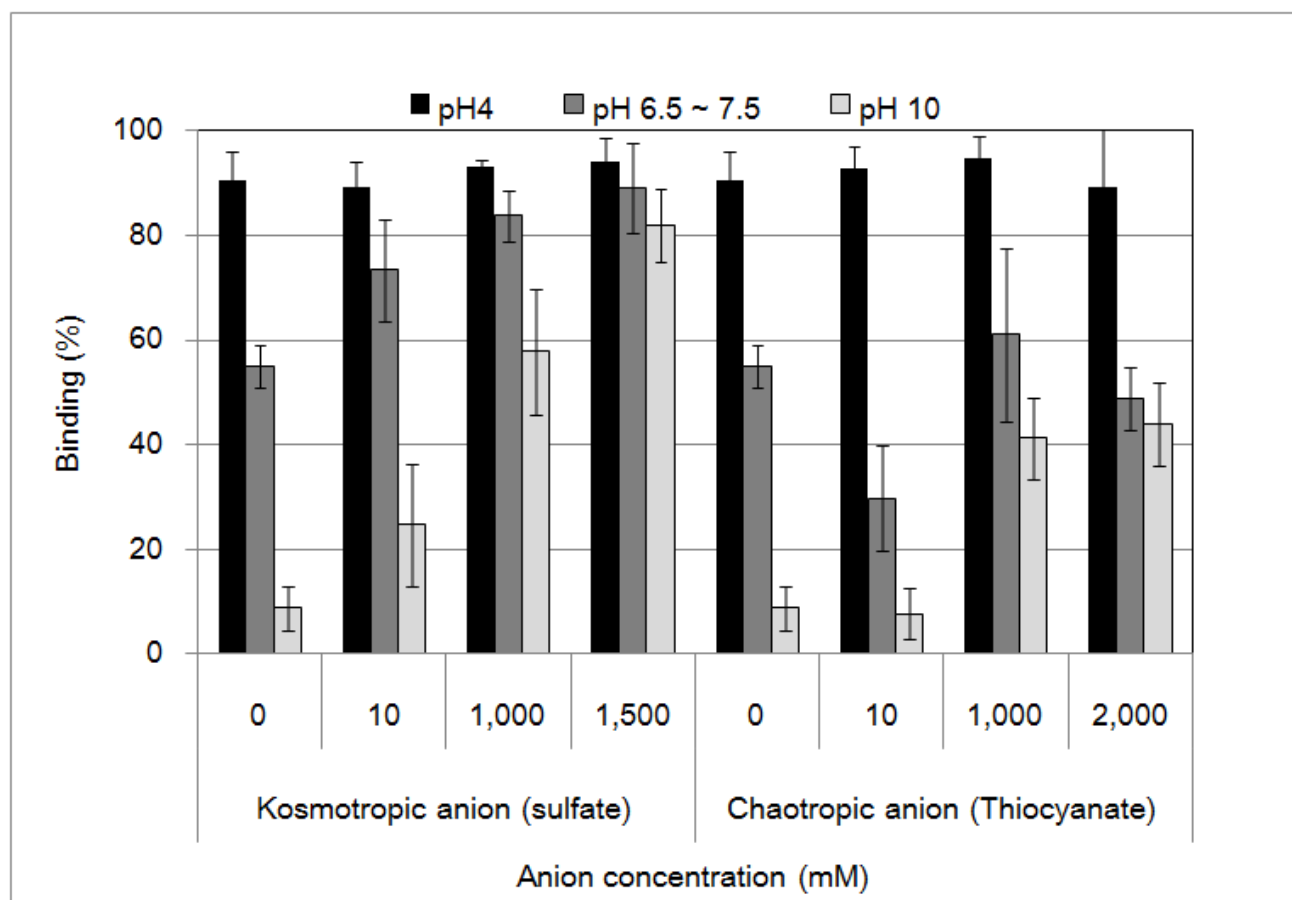
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**Fabrication of PCR chip**

5 types of PCR chips were prepared for the concentration and amplification of target gene. A silicon wafer (Si 100) was treated in a Piranha solution ( $\text{H}_2\text{SO}_4:\text{H}_2\text{O}_2=3:1$  v/v,  $120^\circ\text{C}$ ) for 15 min, and dried after washing under running water. 5 ml of hexamethyldisilazane (HMDS) was coated on the washed wafer using a spin coater, where coating was performed at 500 rpm for 5 seconds and at 4,000 rpm for 40 seconds, and then the coated wafer was baked in a hot plate at  $120^\circ\text{C}$  for 2 min. 5 ml of photoresist (GXR601, AZ Electronic Materials) was coated on the baked wafer, and then coating was performed at 500 rpm for 5 seconds and at 4,000 rpm for 40 seconds. The PR-coated wafer was baked at  $95^\circ\text{C}$  for 2 min using a hot plate. A mask for manufacturing a pillar was installed in a UV aligner (I-line), and the photoresist coated wafer was irradiated at a dose of  $250\text{ mJ}/\text{cm}^2$  at 365 nm UV wave-length. Development was performed using a MIF 300 (AZ Electronic Materials) developer. The developed wafer was hard baked at  $115^\circ\text{C}$  for 2 min. The hard baked wafer was etched with 100  $\mu\text{m}$  of Si using a STS ICP-RIE device. For passivation, we used a plasma of mixture of  $\text{C}_4\text{F}_8$  and Ar at a pressure of 10 mTorr and with 800 W of RF power. For etching we used a plasma of mixture of  $\text{SF}_6$  and Ar at a pressure of 35 mTorr and with 2000 W of RF power. Photoresist was ashed from the etched wafer using an Asher device at a pressure of 50 mTorr and with 300 W of RF power. The ashed wafer was treated in a Piranha solution for 15 min, washed and dried in order to remove and wash remaining PR. The resulting wafer was treated with diluted HF for one min and natural oxide was removed. For  $\text{SiO}_2$  development, thermal wet oxidation was performed using vapor to develop a thickness of 300 nm. The wafer was then treated in a Piranha solution for 15 min, washed and dried. A glass substrate was placed on the washed wafer, and  $400^\circ\text{C}$  of heat and 1,000 volts were applied to complete the microchip.



**Figure S1.** Binding efficiency of *E. coli* gDNA according to pH and concentration of a kosmotropic salt or chaotropic salt. The left panel represents results of measuring binding efficiency of *E. coli* gDNA using  $\text{SO}_4^{2-}$  as a kosmotropic salt, and the right panel represents results of measuring binding efficiency of *E. coli* gDNA using  $\text{SCN}^-$  as a chaotropic salt. The binding rate was calculated by measuring DNA concentration in the output solution using fluorescence spectrophotometer and PicoGreen® dsDNA assay kit (Invitrogen). The nucleic acid binding efficiency is the highest at pH 4, and the nucleic acid binding efficiency is the lowest at pH 10, and it can be seen that nucleic acid binding efficiency increases as a concentration of the salts increases. In the case of using a kosmotropic salt, as the concentration of  $\text{SO}_4^{2-}$  increases, binding efficiency of nucleic acid increases even at pH 10. Therefore,

it can be seen that binding efficiency of nucleic acid has little difference at pH 4 and pH 10 when a concentration of  $\text{SO}_4^{2-}$  is 2,000 mM. When a chaotropic salt is used in a low concentration, binding efficiency of nucleic acid is similar to that obtained when a kosmotropic salt is used in a low concentration. However, when the concentration of the salt is 2,000 mM, binding efficiency of nucleic acid decreases as pH increases for the chaotropic salt.