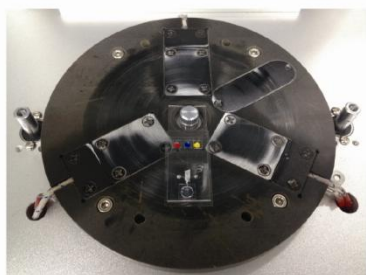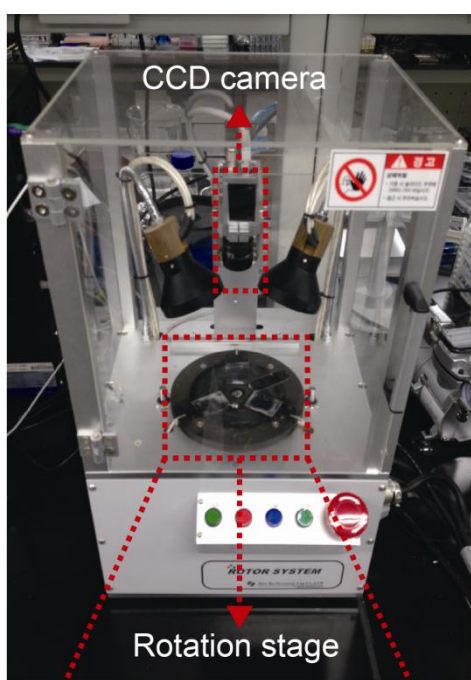# Electronic Supplementary Information

A rotary microsystem for simple, rapid and automatic RNA purification

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Rotary system

Fig. S1 Digital image of a rotary system.

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15 ## Theoretical critical rotational speed

We adopted a simple model by balancing the pressure induced by a centrifugal force with the pressure induced by a capillary force that is given by the Young-Laplace equation.

$$\Delta P = \rho \omega_c^2 \bar{r} \Delta r \ (Centrifugal \ preesure)$$

20
$$= 2\gamma\cos\theta \left(\frac{1}{d} + \frac{1}{w}\right) \ (Capillary \ pressure)$$

Table S1 Parameters of capillary pressure

	$\gamma \ (N/m)$*	$\theta \ (degree)$*	$d \ (\mu m)$	$w \ (\mu m)$	$\Delta P \ (N/m^2)$
R_S	0.072	2	50	120	4077.51
R_W	0.072	2	50	40	6476.05
R_E	0.072	2	50	20	10073.86

R_S = a sample reservoir, R_W = a washing solution reservoir , R_E = an elution buffer reservoir, γ = surface tension, θ = contact angle of liquid on 25 a glass, d = depth of a microchannel, w = width of a microchannel.

*The surface tension and contact angle of water were used.

Table S2 Parameters of centrifugal pressure

	$\Delta P \ (N/m^2)$	$\rho \ (kg/m^3)$	$\bar{r} \ (\mu m)$	$\Delta r \ (\mu m)$	$\omega_c \ (rpm)$
R_S	4077.51	1000	10500	17050	1441
R_W	6476.05	1000	9300	17650	1896
R_E	10073.86	1000	9300	17650	2365

Δr = length of a liquid plug, $\bar{r}$ = mean radial position of a liquid plug, 30 ρ = the density of water, the unit of ω_C is converted from Hz to RPM.
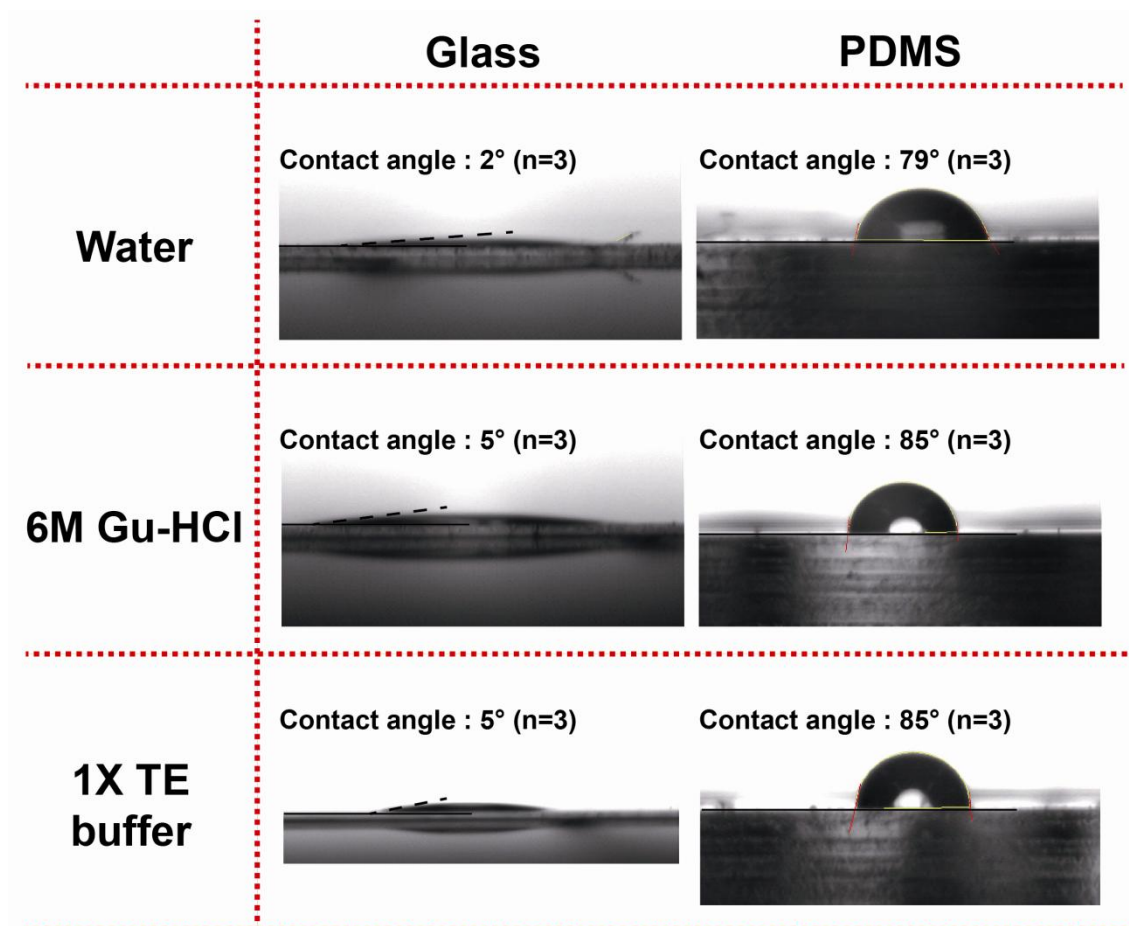
Fig. S2 Contact angles of liquid (water, 6M Gu-HCl, and 1X TE buffer) on the PDMS and glass substrates. Since 6M Gu-HCl and 1X TE buffer was prepared in water, the contact angle values of them are similar to that of water. Thus, the theoretical critical rotational speed of the sample, the washing solution, and the elution buffer was calculated based on the water surface tension and contact angle.