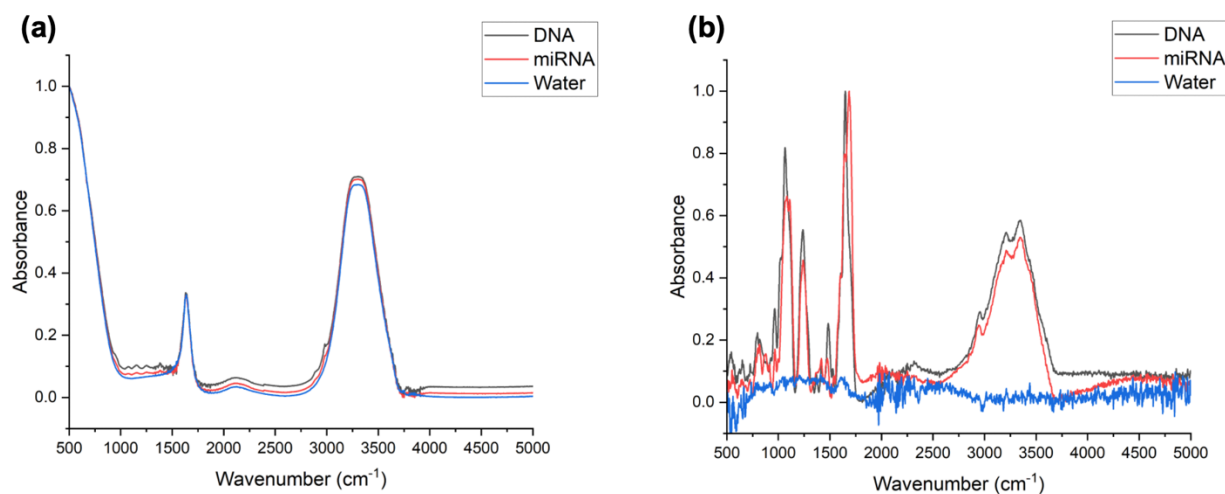


## Supplementary Information

### 1. Vacuum Condition

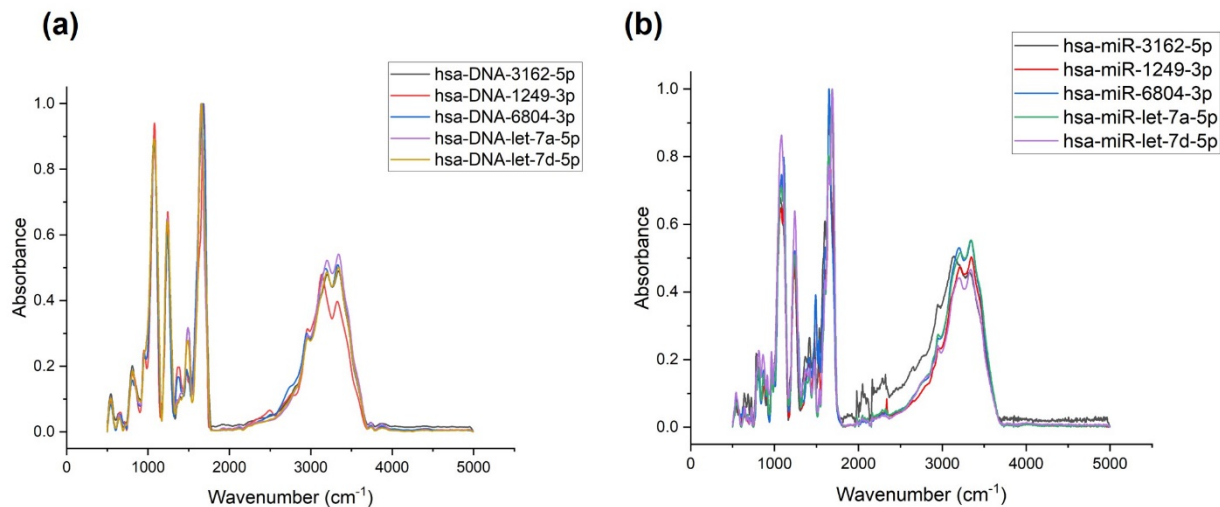
Fig. S1(a) and (b) show the measurement results of DNA, miRNA, and water samples in the liquid form under atmospheric and vacuum conditions, respectively. Water has strong absorption in the infrared region; hence, the absorption peaks of DNA and miRNA molecules were entirely covered by water. With the vacuum process removing the water from the DNA and miRNA solution samples, the absorption peaks of DNA and miRNA molecules could then be visualized.



**Figure S1.** ATR-FTIR measurements of DNA (black curves), miRNA (red curves), and water (blue curves) solution samples under (a) atmospheric conditions and (b) under vacuum conditions.

### 2. Additional Synthetic DNAs and MiRNAs

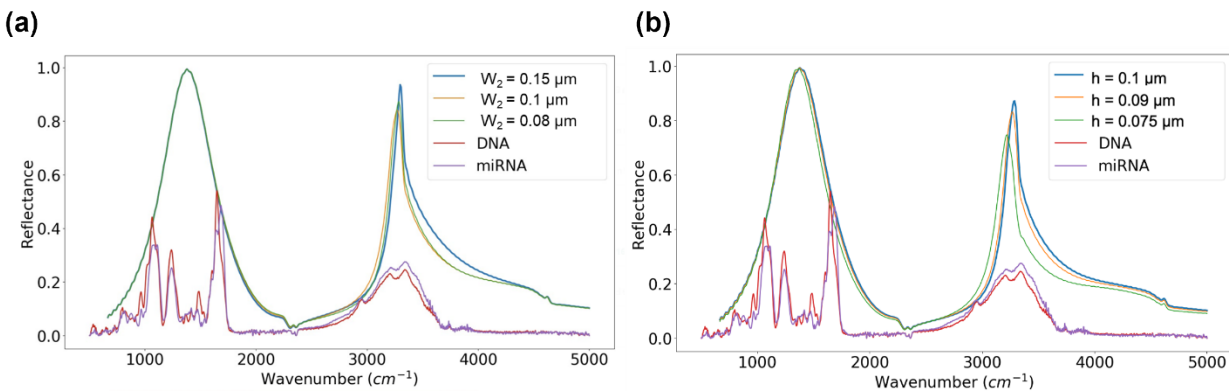
Fig. S2 shows the measured spectra of synthetic DNA and miRNA samples under the vacuum condition. It can be seen that there are slight variations in the peak positions and intensity values of the spectra when comparing different types of DNAs or miRNAs, but the prominent fingerprint regions are broadly located in two regions, 800 – 2000 cm<sup>-1</sup> and 2800 – 3500 cm<sup>-1</sup>.



**Figure S2.** Measurement results of hsa-3162-5p (black curves), has-1249-3p (red curves), hsa-DNA-6804-3p (blue curves), hsa-let-7a-5p (purple curves), and has-let-7d-5p (yellow curves) for (a) synthetic DNA samples and (b) synthetic miRNA samples.

### 3. Additional Simulations

Fig. S3 provides the results of additional simulations. Fig. S3(a) shows that  $W_2$  affects the peak at  $3281\text{ cm}^{-1}$ . An increase in  $W_2$  value increases the resonance wavenumber. Fig. S3(b) shows that  $h$  affects both peaks, and the peak at  $3281\text{ cm}^{-1}$  is more sensitive. An increase in the  $h$  value increases the resonance wavenumber. The peak intensity of at  $3281\text{ cm}^{-1}$  is the highest at  $h = 0.1\text{ }\mu\text{m}$ , hence  $h = 0.1\text{ }\mu\text{m}$  was used for the fabrication.



**Figure S3.** Additional simulation results. (a) Variations of  $W_2$  values. (b) Variations of  $h$  values.