Supplementary Material

Ultra-rapid Detection of Pathogenic Bacteria Using a 3D Immunomagnetic Flow Assay

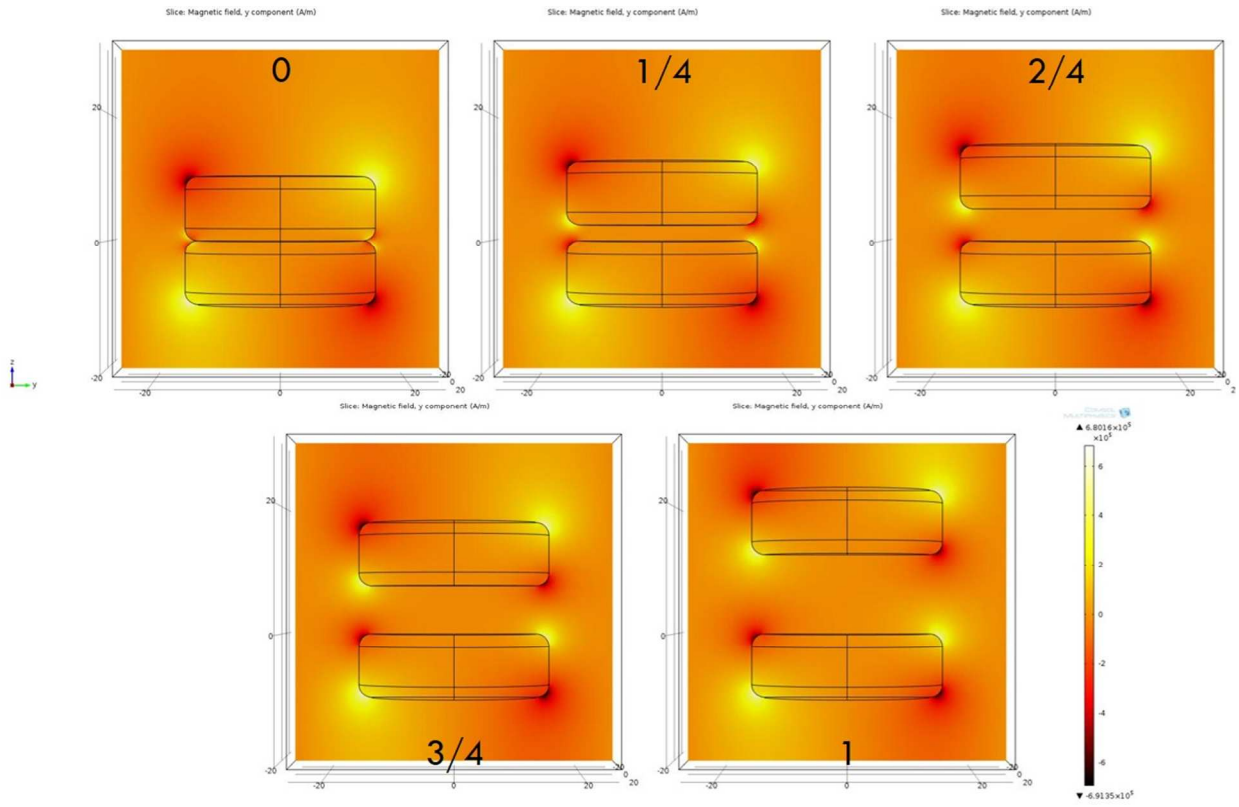

Figure S1. Simulations of the magnetic flux density as a function of the intermagnet spacing distance. A zero gap between magnets resulted in the canceling out of the magnetic flux at the interface due to the presence of a magnetic field of equal magnitude and opposite direction. When the magnets were separated by a certain gap, the magnetic flux at the edges of the magnets immediately increased because the flux cancellation effects were reduced. Simulations of the various possible gap distances between magnets revealed the minimum gap distance needed to retain a strong magnetic flux density, which yielded a compact device.

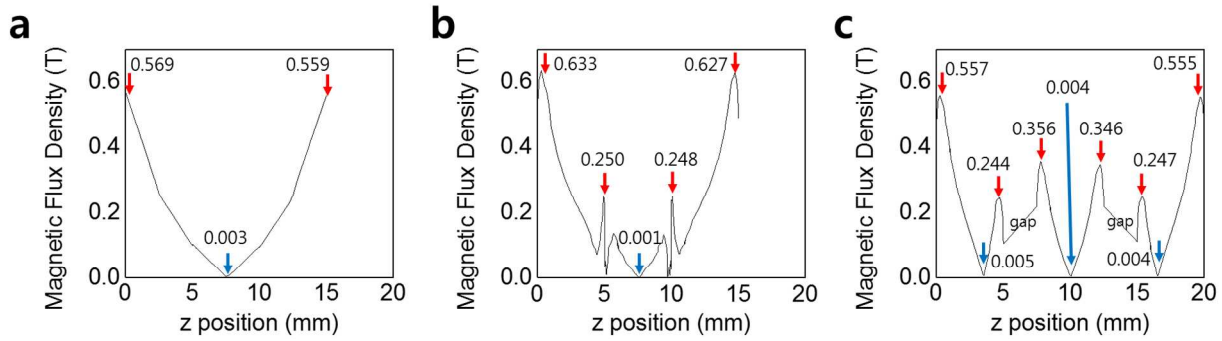

Figure S2. Magnetic flux density near the surface of magnets. Each curve shows the profile of magnetic flux density along the magnet surface in z direction in Figure 2. (a) Perfect disk-shaped magnets without spacers, (b) round-edged magnets without spacers, (c) round-edged magnets separated by spacers

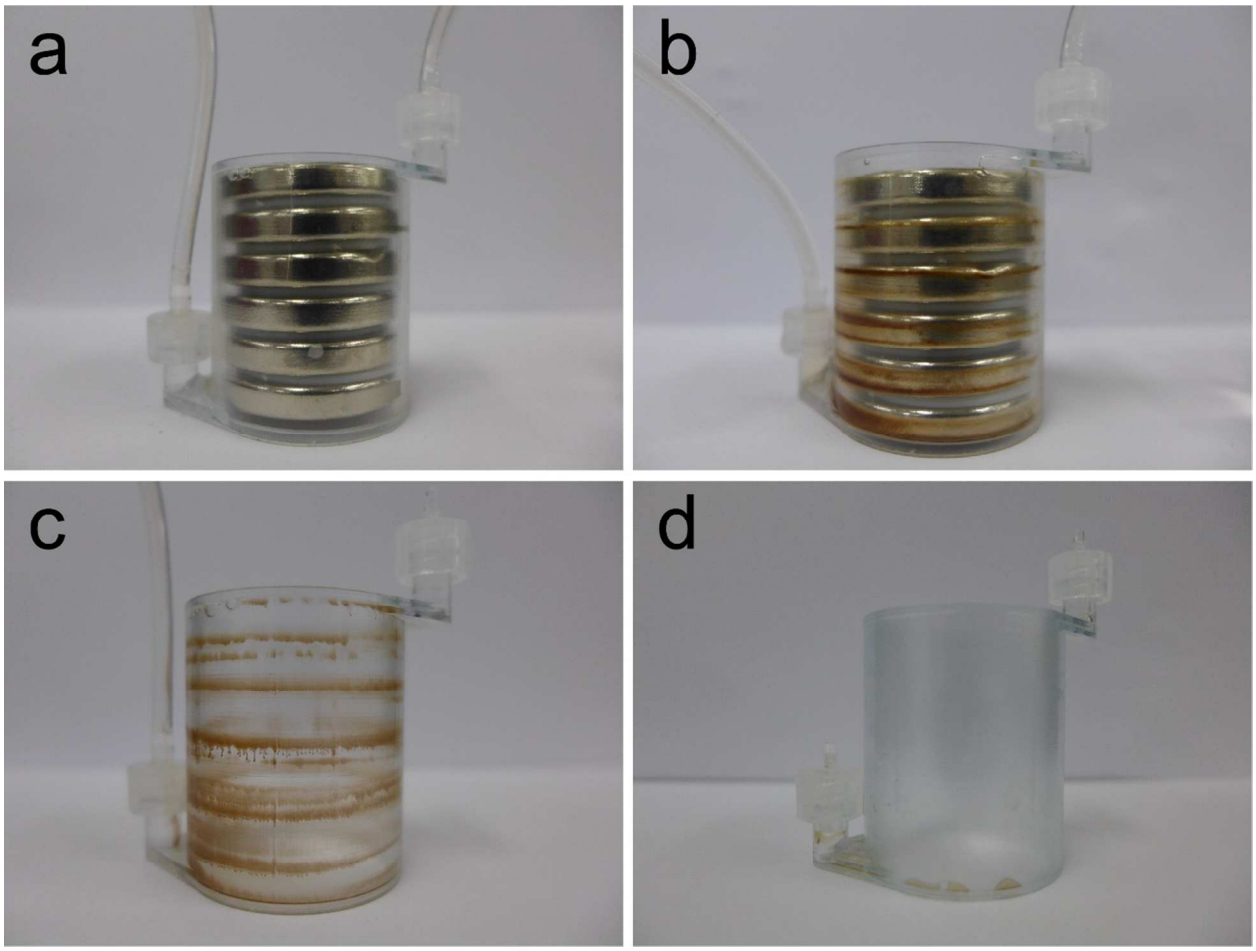

Figure S3. Photographic image of the HEMOS prepared with the magnet–spacer assembly for the capture and collection of magnetic nanoparticles. (a) Before the separation process, (b) after the separation, (c) after the removal of the magnet assembly, and (d) after the collection step. The sample solution entered the device from the inlet at the bottom and exited through the outlet at the top. Once the magnetic particles were captured inside the HEMOS, the flow was stopped and the magnet core was removed. Finally, the captured sample in the device was collected using a disposable syringe and transferred into a cuvette for subsequent luminescence measurements.

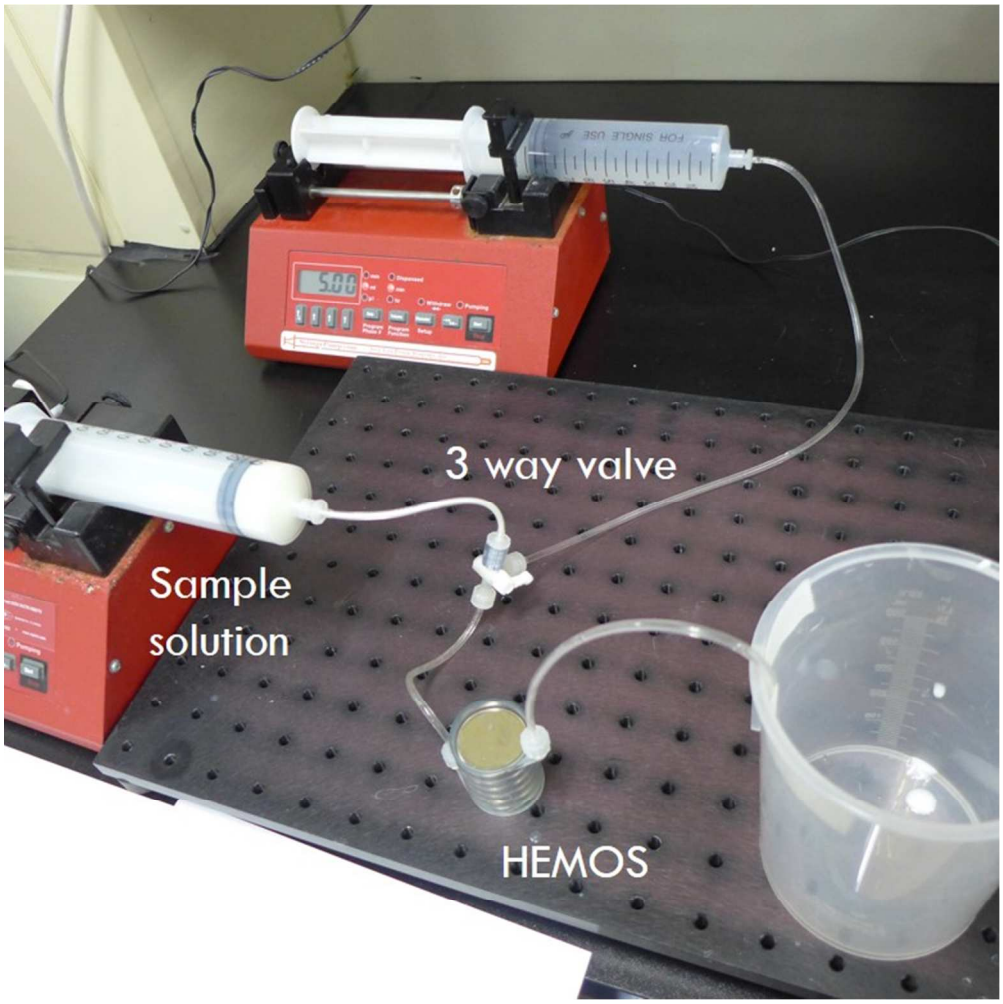

Figure S4. Photographic image of the experimental HEMOS set-up. Before running the flow assay, 6 magnets were inserted into the HEMOS device. The sample solution first passed through the HEMOS pre-loaded with AbMNCs. After the entire sample solution had been processed, the 3-way valve at the sample inlet was closed and the rinsing solution was introduced. The outlet stream was collected into a waste container.