Electronic Supplementary Material (ESI) for Analytical Methods.

Supplementary Information

Fiber bundle based chemiluminescence array detection for multiplex bioassays

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S1. Schematic diagram of the arrangement of fiber sub-bundles

SOG-70S fiber (diameter: 50μm, cladding thickness: 3μm, $\alpha_0 = 70°$) was cut into 50cm long segments. Then, 3300 fibers were tied together to form a 2.9mm×2.9mm square sub-bundle and 96 sub-bundles were tied together to form a fiber bundle of 24mm×36mm, as shown in Fig.S1.

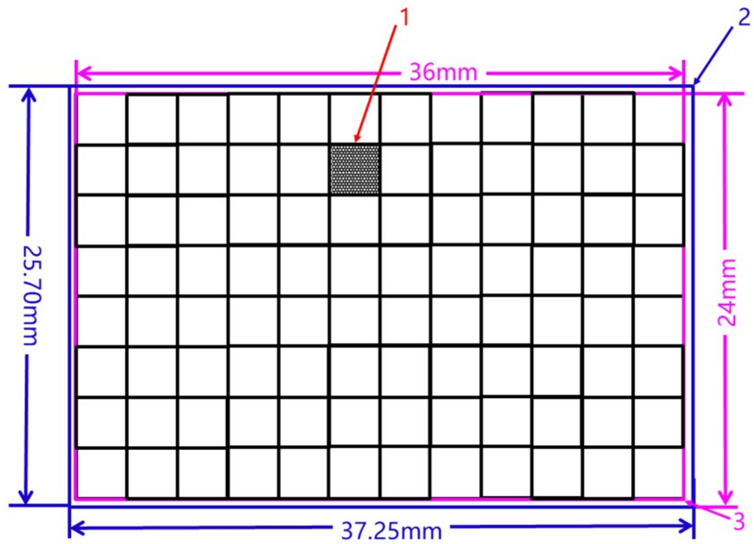

Fig.S1. Schematic diagram of the arrangement of fiber sub-bundles

1: Fiber sub-bundle; 2: Active surface of the CCD; 3: Fiber bundle

S2. Photograph of the lens-based CCD camera imaging system

As a comparison, we set up a lens-based CCD imaging system. As shown in Fig.S2, a CCD camera (Andor, F6) attached with a NIKKOR standard lens (Nikon, AF, f=50 mm, f/1.4D) was used to image the luminescence of the long-lasting luminescent circles.

Fig.S2. Photograph of the lens-based CCD camera imaging system

1: CCD camera; 2: Lens; 3: Luminescent sample

S3. Schematic diagram of the lens-assisted fiber bundle based chemiluminescence characterization system

Because the fiber bundle is hard to manufacture, especially the coupling to the CCD active surface tends to damage the CCD. As an alternative approach, we also designed a lens-assisted fiber bundle characterization system. As shown in Fig.S3, a similar fiber bundle was used to collect the chemiluminescence and transmit them to the closely packed end. A close-up lens is used to image the closely packed fiber bundle.

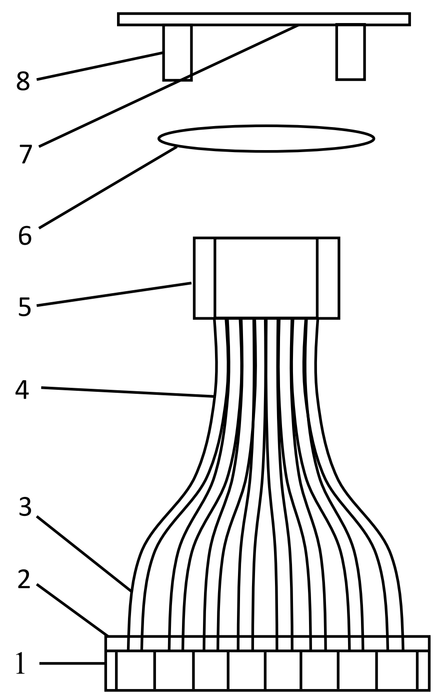

Fig.S3 Schematic diagram of the lens-assisted fiber bundle based chemiluminescence characterization system

1: 96-hole plate; 2: Cover plate; 3: Sub-bundle fiber; 4: Fiber bundle; 5: Fiber holder; 6: Lens; 7: Active surface of a CCD camera; 8: Body of CCD camera.

S4. Long-lasting luminescence intensity taken by the lens-assisted fiber bundle system (exposure time: 20s)

Shown in Fig.S4 is the luminescent intensity of the long-lasting samples taken by lens-assisted fiber bundle system. After background removal, the integrated intensity (inside the pink circle) is about 1.3×10^5.

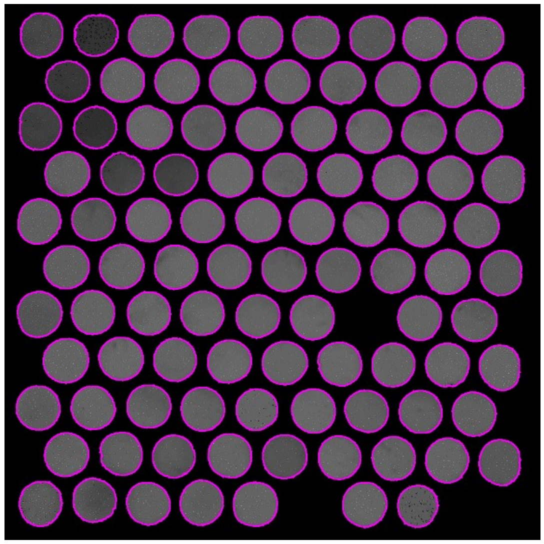

Fig.S4 Long-lasting luminescence intensity taken by the lens-assisted fiber bundle system (exposure time: 20s)

S5. Schematic diagram of the emergent Gaussian beam from an optical fiber

Shown in Fig.S5 is the schematic diagram of the emergent Gaussian beam from an optical fiber. Z is the distance between the fiber and the wavefront, r the radius of the field point from the optical axis, respectively. For the plastic fiber used here, the indices of core and cladding are 1.55 and 1.50. The critical angle $\alpha_0 = \sin^{-1}\sqrt{n_1^2 - n_2^2} = 23°$

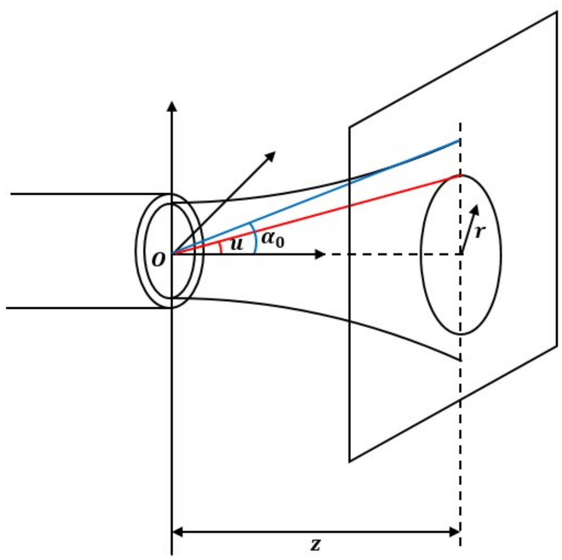

Fig.S5 Schematic diagram of the emergent Gaussian beam from an optical fiber