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Physikalischen Kolloquium  
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**Self-assembled Photonic Crystal for Biomedical Application**

Self-assembled photonic crystal, a type of optical encoding, provides a distinctive encoding strategy for suspension array in biomedical application. Due to multiple markers are required to be detected simultaneously in the screening of diseases to improve the diagnosis rate. Encoding strategy of microcarrier, which is the key technology, is the hotspot in the research of suspension array. As well as other optical encoding strategies such as fluorescent dyes encoding and quantum dots encoding, photonic crystal encoding is easy to be decoded. And what is different from them is that photonic crystal encoding has the characteristics of high stability because the encoding comes from its self-assembled structure.

As an effective encoding strategy, suspension array with photonic crystal encoding implies broad application prospect in the screening and diagnosis of diseases; for instance, malignant tumors and cardiovascular diseases (Fig.1). And based on photonic crystal encoding, a series of labeled and label-free detection methods were developed.

Besides of high-throughput assay, self-assembled photonic crystal was also applied in the capture and detection of circulating tumor cells (CTCs), which is another hot topic in biomedical application. Combined the highly branched dendrimer-amplified aptamer probes with the stable photonic crystal encoding, a simultaneous and highly sensitive, reliable and specific capture and detection of multiple CTCs could be carried out (Fig.2).

As the deepened research, industrialization of self-assembled photonic crystal in biomedical application will be the major direction in the future.

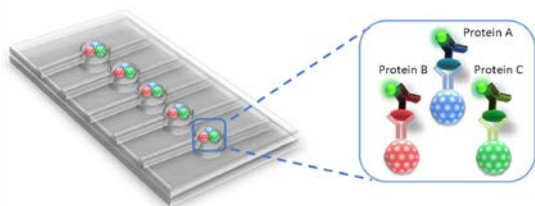


Fig.1 Suspension array with photonic crystal encoding for multiplex detection of markers

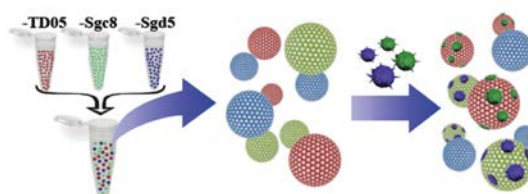


Fig.2 Highly branched dendrimer-amplified aptamer probes functionalized photonic crystal beads for the simultaneous capture and detection of multiple CTC

**Reference**

- [1] F. Zheng, Y. Cheng, et al, "Aptamer-Functionalized Barcode Particles for the Capture and Detection of Multiple Types of Circulating Tumor Cells," *Adv. Mater.* 26, 7333-7338 (2014).
- [2] Y. Zhao, X. Zhao, et al, "Encoded silica colloidal crystal beads as supports for potential multiplex immunoassay," *Anal. Chem.* 80, 1598-1605 (2008).
- [3] Y. Zhao, X. Zhao, et al, "Encoded Porous Beads for Label-Free Multiplex Detection of Tumor Markers," *Adv. Mater.* 21, 569-572 (2009).
- [4] Y. Zhao, X. Zhao, et al, "Multiplex Label-Free Detection of Biomolecules with an Imprinted Suspension Array," *Angew. Chem. Int. Edit.* 48(40), 7350-7352 (2009).