

Nanowire sensors for immunology

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One dimensional nanostructures serving as backbone of the sensor device, have attracted attention as highly efficient elements due to their high surface-to-volume ratio, which simplifies the detection of biochemical species. Use of nanowires enable to ultimately decrease the dimensions of the sensing area of the device and thus increase the resulting sensitivity of the assay (1-3). Finally, nanoscale sensors integrated into lab-on-a-chip system offer attractive opportunity of the multifunctional and multiplexed bio- and chemical analysis that can be performed in real time, directly in-flow.

Focusing on two different subsystems based on (a) silicon nanowire based field effect transistors and (b) gold nanowire based nanocapacitors, we explore their applications in the field of immunology. Namely, first subsystem is used for evaluation of the binding affinities of the peptides, relevant for the immunotherapy of the cancer using modified CAR-T cells. Second subsystem is used to realize an ultra-compact nanosize flow cytometer for real-time impedimetric detection and classification of subpopulations of immune cells. Both investigations demonstrate ability of the nanoscopic sensors to deliver new information about biological species.

References

- [1] L Baraban, B Ibarlucea, E Baek, G Cuniberti, *Advanced Science* 6 (15), 1900522 (2019).
- [2] P Zhang, S Yang, R Pineda-Gómez, B Ibarlucea, J Ma, MR Lohe, L Baraban et al. *Small* 15 (23), 1901265 (2019).
- [3] B Ibarlucea, T Rim, CK Baek, J De Visser, L Baraban, G Cuniberti, *Lab on a Chip* 17 (24), 4283-4293 (2017).