Special Issue

Single-Molecule Biosensors: Recent Advances and Future Challenges

Message from the Guest Editors

The past decade has witnessed transformative progress in single-molecule biosensors, delivering unprecedented insights into disease signatures, biological heterogeneity, and molecular interactions. This emerging capability to probe and accurately quantify a vast array of biomarkers—including nucleic acids, proteins, and molecular complexes—at the single-molecule level is reshaping biomedical diagnostics, precision medicine, and analytical chemistry. Recent advancements, such as single-molecule fluorescence, portable microfluidic platforms, and digital barcoding, have set the stage for robust panels of molecular diagnostics with application to early disease detection, therapy monitoring, and fundamental biomolecular research. Nevertheless, challenges remain—from substrate engineering and signal amplification to surface passivation, probe design, data analysis, and clinical translation. As the field evolves, there is an urgent need for innovative detection strategies, high-throughput platforms, and new tools to understand molecular complexity in living systems.

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Message from the Editor-in-Chief

Biosensors is a leading journal, devoted to fast publication of the latest achievements, technological developments and scientific research in the exciting multidisciplinary area of biosensors. Both experimental and theoretical papers are published, including all aspects of biosensor design, technology, proof of concept and application. Special issues are devoted to specific technologies and applications, and a selection of the most outstanding papers each year is recognized. Pushing the boundaries of the discipline, we invite original papers, as well as timely reviews on cutting edge fields within the subject area.

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