

Special Issue

Optical Microneedles for Biosensing

Message from the Guest Editors

Dear Colleagues ☒

Microneedle(MN)-based optical sensors have gained widespread recognition due to their successful applications in transdermal sensing from subcutaneous ions and glucose to oxygen and pH detection. MNs are a modern form of transdermal sensing system composed of micro-sized needles on a small patch. MNs offer painless and localized sensing with reduced side effects, improved bioavailability and enhanced patient compliance compared to conventional methods. Optical MNs enable non-invasive access to interstitial fluid (ISF), which is key in analyzing a patient's physiological condition. Optical MNs have emerged as a transformative platform in biosensing, offering unique advantages for real-time, minimally invasive monitoring of physiological parameters. By integrating optical sensing modalities such as fluorescence, Raman and phosphorescence, MNs enable highly sensitive and specific detection of a wide range of biomarkers directly within the skin. Their microscale design allows them to penetrate only the superficial layers of the skin without reaching pain receptors, providing a painless and patient-friendly alternative to conventional blood-based assays.

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