sensors

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Special Issue Reprint

Cantilever-Based Sensors

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Microcantilevers are typically rectangular-shaped bars, approximately 100–200 μm long, 20–40 μm wide, and 0.5–1 μm thick, and are made of silicon or silicon nitride. Their mechanical response is often described as a very soft spring. The static deformation of a cantilever allows for the detection of the smallest forces with unprecedented sensitivity, whereas the resonance frequency of its dynamic response can be used to measure extremely small masses or fluid properties. Cantilever-based sensors have received considerable interest in the last few decades, as they offer an unparalleled opportunity for the development of highly sensitive biophysical and chemical sensors, employed in a very wide spectrum of applications. These sensors have been widely utilized in electronics, automotive and aerospace systems, biophysics, environmental monitoring, and medical diagnosis sectors, among others. Their working principle is often based on the interaction between a micrometric cantilever and its surrounding medium, where the mechanical device responds to changes in some environmental property, such as temperature, pressure, flow, density, viscosity, or the presence of some analytes of interest. In this Special Issue, several meaningful examples of the application of cantilever sensors are considered, and recent experimental performances and updated modeling of their mechanical responses are presented. Finally, some review articles offer the researchers as updated overview on cantilever dynamics and two meaningful applications: endoscopy and high-speed AFM.

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