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On-Site Diagnosis of Traumatic Brain Injury

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Categories:
- Biomedical Engineering
- Mechanical Engineering

Keywords:
- Biomarkers
- Biomedical Engineering
- Mechanical Engineering
- Medical/Health
- Micro & Nanotechnologies
- Microresonator
- Proteins
- Traumatic Brain Injury

Microelectromechanical resonators enable sensitive, inexpensive detection of biomarkers, which are indicators of specific diseases, infections, or other medical conditions. However, the detection of s100B, a protein biomarker secreted in the presence of a traumatic brain injury (TBI), is a difficult task to manage. There are numerous methods for identifying biomarkers, but most dependable methods are cumbersome and involve multiple, time-consuming steps that severely limit on-site diagnosis. There is need for a method of detecting biomarkers easily and practically.

Researchers at Purdue University have developed a novel functionalization technique that utilizes a piezoelectrically induced resonant microsystem, a promising medical diagnostic tool with high sensitivity. A plate-style resonator is used to sense biomarkers, including s100B, by detecting changes in mass due to biomarkers. The mechanical resonator demonstrates simple, yet powerful sensor functionality. This could be a feasible solution for successfully diagnosing potential TBI victims at the time of injury.

Advantages:
-Mechanical, label-free sensing
-Provides high-sensitivity sensing in a fraction of the time
-Portable, can use on-site
-Requires only a small amount of fluid for testing
-Allows for dry sensing, which is advantageous for single-use/on-site diagnostic applications
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Potential Applications:
-Medical tools for TBI diagnosis

Related Publications:
-Nikhil Bajaj, et al. Design and Implementation of a Tunable, Duffing-Like Electronic Resonator via Nonlinear Feedback. Journal of Microelectromechanical Systems, Volume 25, Issue 1, February 2016, pp. 2-10. DOI: 10.1109/JMEMS.2015.2493447
-Vijay Kumar, et al. Bifurcation-based mass sensing using piezoelectrically-actuated microcantilevers. Applied Physical Letters, Volume 98, 153510, April 2011. DOI: 10.1063/1.3574920

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Intellectual Property:

Application Date: July 19, 2018
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