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Manufacturing and characterization of simple cantilever thermal biosensor with Si-Metal thermocouple structure for enzymatic reaction detection

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Highlights

- Cantilever thermal sensor with thermocouple to detect biological reaction.
- The thermocouple consists of 10 μm -thick p-type silicon and chrome layers.
- The thermocouple sensor has ohmic contact structure to realize high sensitivity.
- The fabricated thermal biosensor can detect glucose from 200 to 1000 mg/dl.

We have proposed thin film cantilever thermal biosensor with simple thermocouple structure. Silicon as a high seebeck coefficient material is used to fabricate high sensitivity thermal sensor. The thermocouple thermal sensor with silicon and metal needs heat treatment to realize ohmic contact for high sensitivity. The fabricated thermocouple sensor is evaluated by laser heating to conform the sensitivity and response speed. Glucose oxidase is immobilized on the cantilever by functionalization with streptavidin (SA). The fabricated thermal biosensor is capable of glucose detection from 200 to 1000 mg/dl. The results demonstrate that the proposed simple thermal sensor with thermocouple structure can be used to detect enzymatic reaction heat and has the potential in various applications.

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