engineering proceedings

Abstract

Implantable Blood Pressure Sensors with Analogic Thermal Drift Compensation †

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† Presented at the 8th International Symposium on Sensor Science, 17–28 May 2021; Available online: https://i3s2021dresden.sciforum.net/.

Abstract: Implantable pressure sensors represent an important part of the research activity in laboratories. Unfortunately, their use is limited by cost, autonomy and temperature-related drifts. The cost of use depends on several parameters, particularly their low battery life and the need for miniaturization to be able to implant the animals and monitor them over a time that is long enough to be physiologically relevant. This paper studied the possibility of reducing the thermal drift of implantable sensors. To quantify and compensate for the thermal drift, we developed the equivalent model of the piezoresistive probe by using the Cadence software. Our model takes into account the temperature (34–39 °C) as well as the pressure (0–300 mmHg). We were thus able to identify the source of the drift and thanks to our model, we were able to compensate for it thanks to the compensation circuits added to the conditioning circuits of the sensor. The maximum relative drift of the sensor is (0.1 mV/°C)/3.6 mV (2.7%), a drift of the conditioning circuit is (0.98 mV/°C)/916 mV (0.1%) and the whole is (13.4 mV/°C)/420 mV (32%). The compensated sensor shows a relative maximum drift of (0.371 mV/°C)/405 mV (0.09%). The output voltage remains stable over the measurement temperature range.

Keywords: thermal drift; Cadence simulation; blood pressure sensors; analogic compensation; piezoresistive

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Citation: Mbacke, S.M.D.; El Gibari, M.; Lauzier, B.; Gautier, C.; Li, H. Implantable Blood Pressure Sensors with Analogic Thermal Drift Compensation. *Eng. Proc.* **2021**, *6*, 34. https://doi.org/10.3390/I3S2021Dresden-10126

Academic Editors: Gianaurelio Cuniberti and Larysa Baraban

Published: 17 May 2021

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/I3S2021Dresden-10126/s1.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.