Towards Sustainable and Humane Dairy Farming: A Low-cost Electrochemical Sensor for On-site Diagnosis of Milk Fever

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1 LIG Optimization

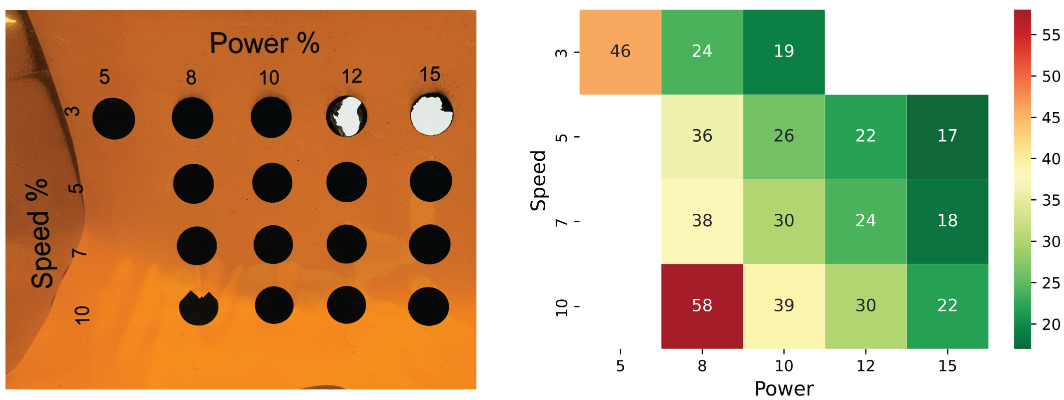

Figure 1: (A) Laser engraved graphene generated with different engraving speeds and laser powers. (B) Sheet resistance measurements for the LIGs under different engraving conditions.

2 Comparison

Table 1: Comparison between our LIG-based calcium sensor and other sensing methodologies used for calcium quantification

Ion to electron transducer	**Slope (mV/dec)**	**LOD (M)**	**Linear range (M)**	**Matrix**	Ref.
Carbon paper	29.80.2	3.3×10^{-7}	10^{-6}–10^{-1}	Water	Bouhoun et al. (2021)
N-phenyl-ethylenediaminemethacrylamide	30.2±0.5	3.2×10^{-6}	$10^{-7} - 10^{-2}$	Serum	Abramova et al. (2016)
Vulcan carbon powder & DOS	28 ± 2	10^{-6}	$5 \times 10^{-6} - 0.2$	Artificial saliva	Ummadi et al. (2016)
Hollow carbon nanospheres	27.8	NA	$10^{-5} - 0.05$	Rat brain	Zhao et al. (2019)
Carbon black modified LIG	30.1	10^{-5}	$10^{-4} - 10^{-1}$	Diluted humsn urine	Teekayupak et al. (2023)
Pre-treated conductive ceramic	26.7 ±1.3	1.0×10^{-6}	$10^{-5} - 0.1$	Seawater	Yin et al. (2019)
Carbon Black	26.3 ± 0.5	10^{-6}	NA	Water	Mousavi et al. (2018)
LIG	27.7± 0.46	15.16×10^{-6}	$2.5 \times 10^{-6} - 10^{-2}$	Bovine serum	This Work

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