Supporting Information

A simple reagent-less approach using electrical discharge as a substitution for chelating agent in addressing DNA hybridization based genomic assay inhibition by divalent cations

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1. Structure of target ssDNA

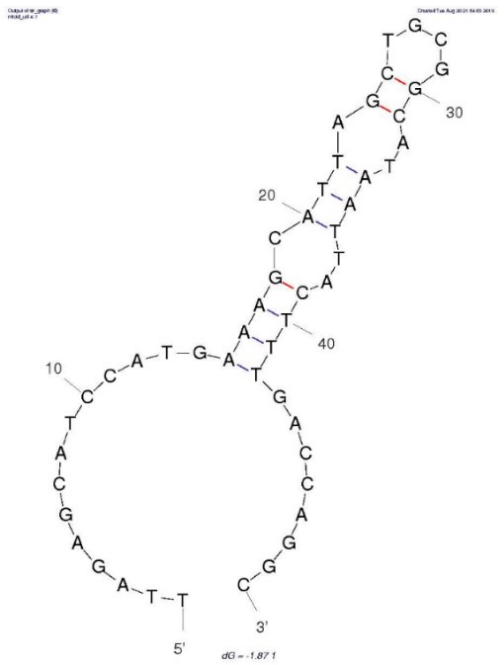

Fig. S1. Secondary structure of target ssDNA used in this study, predicted by Mfold (ΔG = -2.35 kcal/mol)

2. Electrical discharge setup

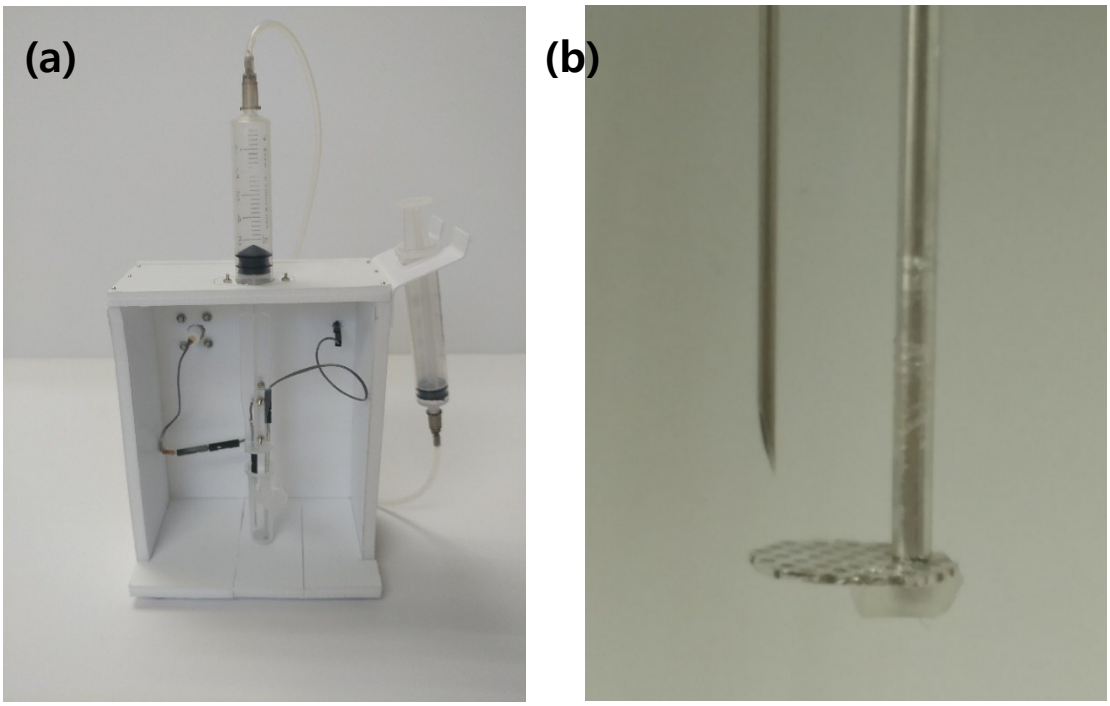

Fig. S2. Photos of the (a) experimental setup and (b) electrodes employed in the experiment.

3. Effect on pH as a result of electrical discharge treatment

Method: In order to monitor pH change as a result of electrical discharge treatment before DNA hybridization of the NanoGene assay, the pH of the hybridization buffer (DIG hyb buffer) was measured after 0, 2, and 4 min of electrical discharge treatment. For each duration, electrical discharge treatment was performed on multiple buffer volumes of 180 μL to achieve a total volume of ~ 4 mL. Once ~ 4 mL of buffer has been accumulated (for each duration), its pH is measured by a pH meter (Orion, Thermo Fisher Scientific, MA, USA).

Results and Discussion: As shown in Fig S3, the pH change was negligible for 0, 2, and 4 min of electrical discharge. The pH difference after 0 min and 2 min treatments was not significant (t-test, *P* value = 0.1609 >> 0.05). Similarly, the pH difference between after 0 min and 2 min treatments was also not significant (t-test, *P* value = 1.000 >> 0.05). Therefore, this result indicated that pH change was not responsible for the mitigation of Mg^{2+}. Hence, the mitigation of Mg^{2+} could be more reasonably attributed to the presence of negative charge/charged entity as shown in Fig. 1.

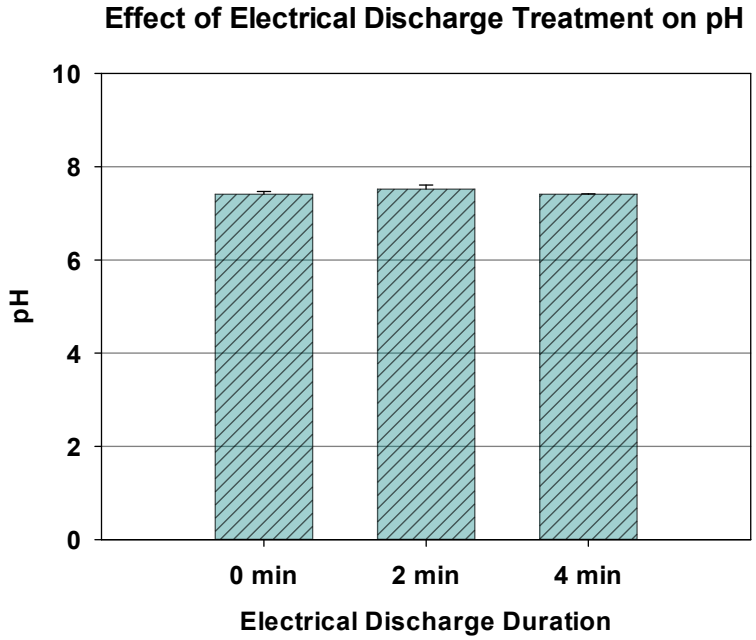

Fig S3. The pH change of DNA hybridization buffer during electrical discharge treatment. Mean and standard deviation were obtained from the triplicate samples.

Table S1. Comparison of proposed electrical discharge technique to the use of EDTA in the mitigation of Mg^{2+} ions in water sample.

	Electrical Discharge	**EDTA**
Type	Electrical	Chemical
Environmental Impact	Negligible	Persistent and hazardous[1,2]
Ecological Impact	Negligible	Negative impact on aquatic and soil ecology[3,4]
Treatment Duration	4 min	Few seconds
Cost	Low	Low
Replenishables	None	Yes

References.

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2. WHO, Edetic acid (EDTA) in drinking water, World Health Organization: Geneva, 2003.
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4. G. P. Fitzgerald and S. L. Faust, Appl. Microbiol., 1993, 11, 345-351.