



**CALIFORNIA SCIENCE & ENGINEERING FAIR  
2019 PROJECT SUMMARY**

<b>Name(s)</b>  <b>Wonjin Ko</b>	<b>Project Number</b>  <b>S1710</b>
<b>Project Title</b>  <b>A Novel Method of Dielectric Nanopores for Electrophoresis Measurements of Nanoparticles</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> The objective of this study is to detect particles other than DNA by increasing the translocation time of the particle and increasing sensitivity through the use of hydrogel.</p> <p><b>Methods</b> Materials: Norcada 30 nm TEM Grid, Teflon Box, AgCl electrodes, 10nm Au particle, LabView, Clampfit Software, Oxygen Plasma Cleaner, Op Amp (OPA2134PA), Resistor 4.12 M ohms, 1k ohms, 1 M ohms, 1 M KCl Buffer, Silicon gasket, Faraday Cage, Exopatch</p> <p>Procedure: Created 30nm pore via dielectric breakdown and then translocated Au particle via electrophoresis while trapping the particle using hydrogel to increase the sensitivity of the pore as well as to increase the dwell time. The results were compared to those of a control group without hydrogel.</p> <p><b>Results</b> Au particle was measured using 30nm pore. However, the machine could barely detect the sudden fluctuation of resistance as a result of translocation. However, by blocking the other side of the pore using a hydrogel which acts like a fishnet successfully increased the sensitivity and the translocation time.</p> <p><b>Conclusions</b> The detection rate of nanopore for short particles was almost impossible. However, using PEG hydrogel successfully detected Au particles by increasing the translocation time. This shows a promising application for detecting various particles using the combination of dielectric nanopores and hydrogel</p>	
<b>Summary Statement</b>  By utilizing solid state nanopores and hydrogel, we successfully demonstrated potential for detecting various particles with very small concentration	
<b>Help Received</b>  My mentor directed me to relevant published papers and explained the science of electrophoresis . He also helped me design the circuit diagram and code LabVIEW, as well as providing the necessary materials.	