**[TITLE]**

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**1.** **Summary**

**Here you should briefly summarize the work you would like to do. The three main ideas a proposal should communicate are: (1) Communicating novelty and/or importance of the study (why it should be done), (2) Explaining proposed work with specificity (what will be done), and (3) Methods and techniques to be employed (how it will be done). All three should appear briefly in the summary before appearing in more detail in the following sections.**

Different crystal structures yield different dielectric constants. For this project we want to see how changing atoms in a silicon crystal affects the change in the dielectric constant. We will gradually add more carbon atoms to the silicon unit cell. Carbon was chosen because both carbon and silicon can create the same diamond-shaped unit cell.

**2.** **Scientific Background**

The dielectric constant, also known as relative permittivity, is a unitless measure that relates the permittivity of a material to the permittivity of free space. It can also be written as a ratio of the capacitance of the material to the capacitance of free space. Some things that influence the dielectric constant are frequency, temperature, structure, moisture, and morphology.

The dielectric constant also determines certain characteristics of the material. Materials with a high dielectric constant are more resistive, which makes them better insulators, therefore they are poor capacitors, and capacitors are highly polarizable. Therefore, using the dielectric constant, the capacitance and polarizability can be predicted for a given material. Some areas this knowledge is used include energy storage, electronic packaging, and embedded capacitors.

**3.** **Proposed Research**

Swap out atoms in the silicon crystal unit cell with carbon atoms one by one to compare the modified crystals’ dielectivitosity. We will change each atom and then relax it to its lowest energy state. If time allows, we want to also see how symmetry

**4.** **Methods**

Sources

<https://omnexus.specialchem.com/polymer-properties/properties/dielectric-constant>

<https://pranabdas.github.io/espresso/hands-on/epsilon>