# Investigating the Potential of Titanium Dioxide Solar Cells

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$TiO_2$ was employed in a photovoltaic application by Michael Graetzel in 1992. A fabrication method very similar to the one he described in his patent is used in this investigation. Using Titanium dioxide ($TiO_2$) in photovoltaic applications has a great potential for satisfying the increasing energy demand of the new century. $TiO_2$ is more efficient than conventional silicon type cells due its larger band gap. Band gap is a material property that is governed by the distance between the conducting and valence shell of an element. When electromagnetic radiation strike a semiconducting material, an electron can be ejected depending on the frequency of the energy. The band gap dictates how much energy an electron has when it is released from the lattice. Band gap is an integral component of the photovoltaic effect. The higher band gap in unit of electron volts directly translates into a relatively greater energy-producing cell. $TiO_2$ is photo-reactive in the UV potion of the electromagnetic spectrum. The Earth's atmosphere prevents most UV light from reaching the surface. To harness the power of $TiO_2$ here on Earth, the material is dyed with a pigment such as silver (Ag). Silver is a material that is photo-reactive in visible light. In a chain reaction the dye will eject an electron when excited, this electron will then excite an electron on the $TiO_2$. Silver has a relatively high absorbency and at the same time it covers a broad portion of the wavelengths in visible light. The silver used comes from a synthesis that separates silver into four and nine atom clusters. Dr. Ramesh Patel developed this synthesis in which he uses poly-acrylic acid to separate the element into small clusters.

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