The Creation of Manganese (IV) Oxide Nanosheets as a Inexpensive and Effective Method of Measuring Blood Glucose

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Diabetes is an international health crisis. There is an extreme need for adequate testing methods. This led us to ask the question: Can we use manganese (IV) oxide nanosheets to create an inexpensive and effective method of measuring blood glucose? We made manganese (IV) oxide nanosheets to monitor blood glucose levels and coded an effective method of documenting blood glucose concentrations. Manganese oxide nanosheets were made from potassium permanganate and 2-morpholinoethanesulfonic acid buffer. Manganese ion is responsible for the yellow color, but in the reaction with hydrogen peroxide, manganese ions are released. Glucose oxidase from Aspergillus niger converted the glucose from the original glucose solution and produced hydrogen peroxide, which then reacted with the manganese oxide nanosheets to create a color change. To model the glucose levels of the blood, a 7.8 mM glucose solution was made to model normal blood glucose levels and a 11.1 mM glucose solution was made. Color changes from these two benchmarks as well as other glucose concentrations in between the two values were recorded and merged together to form a color gradient relating to specific glucose levels. The gradient was then placed on an OMR sheet with bubbles under each color for the patient to fill in. We wrote the code of an OMR sheet reader, allowing the patients to scan OMR sheets and get data directly into an excel file for simple tracking of their blood glucose levels. These excel sheets can then be seen by medical professionals and used to provide better diabetic treatment. The provision of this inexpensive blood glucose test has the capability of diagnosing and monitoring diabetes, further improving the available healthcare for low income communities internationally.

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