ENCAPSULATION DEVICE SYSTEMS WITH OXYGEN SENSORS WITH OR WITHOUT EXOGENOUS OXYGEN DELIVERY

CROSS REFERENCE

[0001] This application claims priority to U.S. Patent Application No. 62/417,005, filed November 3, 2016, the specification(s) of which is/are incorporated herein in their entirety by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to encapsulation devices for cells (such as but not limited to islet cells, stem cell derived beta cells, or the like, e.g., for regulating blood glucose, or other cells or spheroids that can produce and release a therapeutic agent that is useful in the body), more particularly to encapsulation devices with oxygen sensors and an exogenous oxygen or gas delivery system creating a closed-loop system.

GOVERNMENT SUPPORT

[0003] This invention was made with government support under Grant No. DK106933, awarded by NIH. The government has certain rights in the invention.

BACKGROUND OF THE INVENTION

[0004] The present invention features systems with encapsulation devices for cells (such as islet cells or stem cell derived beta cells or the like) and sensors for real-time monitoring of cells or analytes (such as oxygen levels, glucose levels, pH, lactate levels, carbon dioxide levels, etc.). The encapsulation devices may be loaded with cells or may be empty. The systems may be operatively connected to an oxygen generator or a gas delivery system (e.g., an air pump, a chemical oxygen generator, etc.). The sensors may be optical, electrochemical, or a combination thereof.

[0005] In some embodiments, the system (e.g., encapsulation device with oxygen sensors) and oxygen generator (or gas delivery system) are in a closed loop with the sensor reader that can regulate the delivery of oxygen or other gas to the device based on the levels of oxygen that the sensor is reading from the sensors. The integration of sensors into the device (e.g., a sensor inside the device, a sensor on the outside of the