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Cellular Silica Encapsulation for Development of Robust Cell Based Biosensors ROBERT JOHNSTON, Materials Engineering Department, New Mexico Tech, SNEZNA ROGELJ, Biology Department, New Mexico Tech, JASON HARPER, Sandia National Laboratories, MICHAELANN TARTIS, Chemical Engineering Department, New Mexico Tech — In order to detect chemical and biological threats both on the battlefield and in civilian life, development of portable, robust detection systems capable of real-time identification of the chemical and biological agents are needed. Living cell–based sensors have proven effective as sensitive, specific, near real-time detectors; however, living cell-based sensors require frequent cell replenishment due to cell sensitivity to the ex-vivo environment, which limits sensor stability. Incorporation of living cells within a biocompatible matrix that provides mechanical protection and maintains access to the external environment may facilitate the development of long-term stable cell-based biosensors. We are exploring the use of a novel Chemical Vapor into Liquid (CViL) deposition process for whole cell encapsulation in silica. In CViL, the high vapor pressure of common silica alkoxides is utilized to deliver silica into an aqueous medium, creating a silica sol. Mixing of cells with the resulting silica sol facilitates encapsulation of cells in silica while minimizing cell contact with the cytotoxic products of silica generating reactions. Using fluorescence microscopy analysis with multiple silica specific markers, encapsulation of multiple eukaryotic cell types (Saccharomyces cerevisiae, Jurkat, HeLa, and U87 cells) with CViL generated silica is shown, providing a foundation for development of long –term stable cell-based biosensors with diverse sensing capabilities.

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