

Co-encapsulation of Oxidoreductases and Cofactor for Self-Sufficient Nanoreactor

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Oxidoreductases is promising enzyme family for synthesis of value-added chemicals due to its selectivity, reaction rate and mild reaction condition. However, these enzymes often require cofactors, which are expensive and small molecules making them difficult to reuse in the enzyme processes. To overcome this hurdle, we have developed a self-sufficient nanoreactor containing two oxidoreductases (formate dehydrogenase and mannitol 2-dehydrogenase) and nicotinamide adenine dinucleotide (NAD⁺). To encapsulate NAD⁺ inside nanoreactor, we conjugate NAD⁺ to alginate, which enables its retention in the nanoreactor with the enzymes during reaction product removal with minimal leaching. There are no substantial reduction of enzymatic activity inside nanoreactor compared with free enzymes and ratio of enzymes and cofactor can be controlled for efficient enzyme process. The system can produce multiple batches of chemicals without enzymes and cofactor supplementation.