Stable Protein 1 Hemin Complex as Peroxidase Mimicking Artificial Enzyme

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Enzymes are amazing biocatalysts that gained their unique properties through billions of years of evolution. These biocatalysts allow a high reaction rate with low activation barriers that enable life on earth as we know them today. While enzymes are designed for specific reactions in vitro or ex Vitro, in some industrial processes, unnatural reactions or conditions are required. Enzyme activation requires specific conditions, which are not always available at the industrial level, and therefore, alternatives should be explored. Here we present a new approach to artificial enzyme design. These artificial enzymes could operate under a variety of conditions pushing the existing limits and extending the available chemistries. Towards these goals, we developed a proof of concept artificial enzyme which is based on stable protein 1 (SP1). The SP1 is an extremely stable ring-shaped protein, and its inner cavity can be easily bioengineered to enable the formation of cofactor-protein interactions that in turn mimic the enzyme's active site. By rational design approach, we engineered the protein cavity to form an activated complex with heme that mimic the activity of the peroxidase enzyme. The characterization of this artificial enzyme and its utilization for biosensing will be presented.