Design of a Single Protein that Spans the Entire 2V Range of Physiological Redox Potentials

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Technology description

Dr. Yi Lu from the University of Illinois has designed a single protein to tune its electron-transfer ability across a 2-V range of physiological redox potentials. The design of azurincovers a range from +970 mV to -954 mV vs. standard hydrogen electrode (SHE), by mutating only five residues and using two metal ions. Given the wide range of potentials attainable from a single protein possessing the same overall fold and surface properties, these azurin variants enables scientists and engineers to take advantage of these water-soluble redox agents for biochemical and biotechnological applications such as solar energy transfer and other alternative energy conversions. Since tuning the potentials of many inorganic, bioinorganic and organometallic catalysts can result in catalysts with different oxidation states with dramatically different catalytic efficiency for different substrates, this technology allows tuning of redox properties of numerous catalysts for even wider applications, such as small molecule activation and synthesis of important intermediates or products for pharmaceutical applications.
Dr. Lu's research interests lie at the interface between chemistry and biology. His group is developing new chemical approaches to provide deeper insight into biological systems. At the same time, they take advantage of recently developed biological tools to advance many areas in chemistry. Research in his lab has resulted in more than 20 US and international patents as well as successful products in environmental monitoring and medical diagnostics .

Advantages

Ability to tune entire range of redox potentials
Tuned azurins can be used as water-soluble redox agents

Institution

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