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A comparative superoxide radical sensing study: Designing of different sensing platforms, enzyme-free superoxide radical sensing, and biological applications

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Oxygen radicals ($O_2^{\bullet -}$) has attracted considerable attention due to their harmful interaction with biological molecules and their involvement in signaling pathways. Under normal metabolic conditions, $O_2^{\bullet -}$ is produced at a rate that is matched by the capacity of tissue to catabolize them. When its production exceeds the body's natural ability to deal with the potentially cytotoxic species, a variety of pathological conditions may result including cancer, stroke, and neurodegeneration. Therefore, our research team has focused on detecting the oxygen radicals with biocompatible, sensitive, high performanced detection systems. For this purpose, a series of $O_2^{\bullet -}$ sensing studies have performed since 2005. The design of $O_2^{\bullet -}$ sensing platforms using superoxide dismutase (SOD) enzym which plays an important role in cell protection mechanisms against oxidative damage from reactive oxygen species and is a ubiquitous metalloenzyme in oxygen-tolerant organisms was done. In the early studies, it was used various supporting polymers, like gelatin, alginat, chitosan hydrogels, as biomolecule carrier. When nanotechnology became popular in biotechnology, we started to use some nanoparticles to design more sensitive, rapid, and mechanical durable platforms. In recent years, enzyme-free detecting systems became popular, yet it cannot be applied to all biosensor systems including enzymatic reaction. Our recent study showed that superoxide radicals could detected with CuZn alloy nanoparticles which is being in catalytic center of SOD enzyme. It was used the CuZn nanoparticles as external catalyzer for dismutation reaction. In all studies, the systems designed in different biological samples like cancerous brain tissues or stressed plants to show the systems are suitable for the clinical analysis were applied. Main purpose of all these studies was to make human life easier.

Biography

Kaan Cebesoy Emregul received his PhD in April 1998 from Ankara University. Then he was granted NATO Scholarship Norwegian Technical Institute, Trondheim Norway and joined the Research Group of Prof Dr Kemal Nisacioglu in Norwegian Technical Institute, Trondheim Norway (1995-1996). He has authored around 30 papers. He is interested in Electrochemistry Voltammetric techniques, Electrochemical Impedance Spectroscopy, corrosion and metallurgy inhibition of metals, design of organic inhibitors, TGA-DSC analysis, nanotechnology and nanochemistry, biosensors and application in the diagnose of disease. He is now Professor of Chemistry at the Science Faculty, Department of Chemistry, University of Ankara.

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