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Non enzymatic glucose sensor based on au-ru nanoparticles with high resistance against chloride poisoning

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Diabetes is the 6th most common cause of death and can lead to serious and costly complications. To avoid them, the patient must be able to manage his blood glucose level. Great efforts have been devoted to improving glucose biosensor to determine the glucose level. As enzymatic glucose biosensors suffer from many problems, non-enzymatic glucose sensor based on nanoparticles was utilized to solve these problems, because it shows good performances through increasing the surface area and enhancing the mass transport and catalysis. Bimetallic Au-Ru nanoparticles (NPs) with novel core-shell morphology were prepared through a single-step microemulsion synthesis for the decoration of multi-walled carbon nanotubes (fMWCNTs). The presence of Ru leads to particles with smaller diameters, improved distribution and adhesion on fMWCNTs, affording very good accessibility to the catalytic sites. To validate this elaborated structure, the effect of Ru on the activity and effectiveness of the catalyst were studied to detect glucose in alkaline solutions. Au-RuNPs/fMWCNTs exhibits a high sensitivity of 28.7 μAmM−1 cm−2 toward glucose and provides a linear range for physiological concentrations (1 mM – 10 mM). Contrary to Au, the Au-RuNPs/fMWCNTs electrode is highly resistant against poisoning by chloride ions, and the interference from the oxidation of common interfering species is effectively suppressed. Additionally, the presence of interfering species (fructose, galactose, ascorbic acid…) affects only marginally the response toward glucose. The role of Ru and the special core-shell morphology are discussed. The Au-RuNPs/fMWCNTs electrode exhibits good selectivity, high sensitivity toward glucose oxidation and applicability for glucose detection in real human serum samples, this is promising for the future development of non-enzymatic glucose sensors.

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