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Functionalization of gold nanoparticles with amino acid as a promising alternative for L-asparaginase detection

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Abstract:

L-asparaginase, a bacterial amidohydrolase enzyme, is one of the most employed drugs in the course of Acute Lymphoblastic Leukaemia (LLA) and other lymphoid neoplasms treatment. However, the immunological inactivation of the enzyme may go unnoticed by the side effects caused by cancer treatment. This work reports an alternative method to detect L-asparaginase activity using an optical biosensor traduced by a power sign. The biosensor was composed of monodisperse gold nanoparticles synthesized with amino acid asparagine as a reducing, stabilizing and functionalizing agent. Facile colorimetric assays was applied in order to ensure stable gold nanoparticles were formed. In this study, the detection of L-asparaginase was successfully performed by the aggregation and red-shifting of the surface plasmon resonance (SPR) of nanoparticles when both substances were together for 30 minutes. The colour changes observed were quantified by a linear and reproducible power sign. The enzyme proved to have a higher capacity of disestablish gold nanoparticles functionalized with asparagine when submitted to temperature of 37oC, regardless of asparagine concentration used in the synthesis. The results suggests a positive effect of ammonia ions produced by the depletion of asparagine in aspartic acid on such disestablishment of gold nanoparticles. Theses outcomes lead us to assume that gold nanoparticles functionalized with asparagine is a promising biosensor for detection of L-asparaginase activity during LLA treatment.

Biography:

LUCIANA PEREIRA TORALLES has graduated in Chemical Engineering in 2014 and has completed her master's degree from Federal University of Bahia in 2016. She is currently a PhD student in the Program of Industrial Engineering Processs. She was a monitor of the Experimental Chemistry and Physical Chemistry II class. She works in the Chemical Engineering area, with emphasis on Biochemical Processes using a number of nanoparticles for biotechnological products and processes for industrial applications.