Application of factorial analysis for the design of a modified carbon-based sensor for the determination of azithromycin

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Abstract

There are several types of antibiotics, natural and synthetic, which inhibit the growth of bacteria by inhibiting the growth of their cell wall. Azithromycin is one of them used to cures various diseases and its discovery marked a major turning point in infectious medicine. Although many lives have been saved, they have become unsuitable for some diseases over time. Drug-resistant bacteria grow and spread, and some even pass their resistance on to other bacteria.

Our aim in this work has been on the optimisation of an alternative electrochemical method for the determination of azithromycin as one of the most used antibiotics. There are several factors influencing simultaneously on the results of an analytical chemistry procedures. The methodology used by the most analysts to optimize an analytical procedure is the classical one, called univariate technique, which is time consuming and does not take into account the interaction between factors. In order to assess which kind of factors are important and to estimate the quantitative role of them and their interactions, factorial design is applied. Through factorial design it is possible to propose an empirical model that might provide a good description of the data. The methodology used in factorial design requires the formulation of a polynomial model approximating the relationship between measured signal (I-current in our case) and the factors (X_i) taken into consideration. In our experiment we have examined three factors that influence the measured signal: the mass of the carbon paste modifier used, which is graphene oxide, dopped with Cu; the pH value of the buffer used as an indifferent electrolyte and the measurement time after each addition. The values found with the help of the models of the equations (coded and real variables) agree with the experimental values, which show that the found equations describes our experiment very well and consequently, they are adequate. From the found models it resulted that the most significant factor and interaction between factors are the pH of the buffer and the mass of modifier and pH together.

References

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