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APPLICATION OF BIREGRESSIONAL DESIGNS TO ELECTRODIALYTIC REMOVAL OF HEAVY METALS FROM CONTAMINATED MATRICES

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Abstract

Given a base design with quantitative factors and a primary linear regression to each of the treatments, we may adjust secondary regressions of linear combinations of the adjusted coefficients on the primary regressions on the factor levels, thus obtaining a biregressional model.

A biregressional design was established for a set of treatments, defined from quantitative factors and a linear regression in the same variables. Afterwards the action of the regression coefficients and their linear correlations was analysed.

This approach was used to study the electrodialytic process (ED), a decontamination technique for removal of heavy metals from polluted matrices. The method uses a low-level direct current as the "cleaning agent", combining the electrokinetic movement of ions in the matrix with the principle of electrodialysis.

The authors have studied the removal of heavy metals from industrially heavy-metal-contaminated soil, preserved wood waste and fly ash from municipal solid waste incinerators using the application of the electrodialytic process. In this paper we show how statistics may support the development of a research line.

The removal of heavy metals was found to be described, in all studies, by low degree polynomials with null independent terms. The coefficient [twice the coefficient] of the first [second] degree terms measuring the initial rate [acceleration] of removal. Our approach enabled the study of the action of the factors defining the treatments on these, and other, coefficients of the polynomials.

Keywords: contaminated soil, preserved wood, fly ash, electro-remediation, biregressional design.

2000 Mathematics Subject Classification: 00A06, 00A71.

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