EXPERIMENTAL DESIGN APPLIED FOR THE OPTIMIZATION OF INAA METHODS

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In this work 2^k experimental design was carried aiming the multivariate optimization of INAA methods. Three important factors of the measurement process were investigated: sample decay time (A), sample distance to detector (B) and measurement time of radionuclide activity in the sample (C). Possible nuisance factors, as sample mass (150 ± 10 mg), sample and standard geometry (10 mm x 8 mm x 1 mm), irradiation time (8 hours) and thermal neutron flux (0.5 to 1.0 10^{13} cm^{-2} s^{-1}) were controlled and considered as constant terms for all experiments of the 2^3 experimental design matrix. Two multielemental methods of Neutron Activation Analysis Laboratory (LAN, IPEN – CNEN / SP) had its factors studied: a first for determination of the total mass fraction of Cr, Co, Fe, Rb, Sc, Se and Zn in biological matrix samples and a second for determination of the total mass fraction of Cr, Co, Fe, Sc and Zn in geological matrix samples. Three replicate analyses for each experiment were carried out aiming to estimate the individual contribution of selected factors in the final mass fraction results. Optimized conditions for each method were outlined by means of accuracy results (trueness and precision), main effects, interaction contrasts and counting statistics uncertainty. According to the results, A and B factors presented the most significant contribution for the optimization of INAA methods for most measurands. On the other hand, factor C does not present significant influence on the final results.