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Application of medium-energy proton beam from AIC-144 cyclotron in biological and environmental studies

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Activation analysis is a well known analytical technique used for performing both qualitative and quantitative analysis of major, minor and trace elements in a given sample, without or with chemical separation. Application of protons with the energy higher than 30 MeV in activation analysis considerably broaden the spectra of possible reaction channels (possibility of (p, xn) reactions, presence of the secondary neutrons which can also interact with a studied sample), which is always associated with some difficulties in the identification of activation products. This must be carefully examined in order to eliminate the existing interferences. AIC-144 cyclotron at the Institute of Nuclear Physics Polish Academy of Science can accelerate proton up to the energy of 60 MeV while the beam intensity does not exceed 50 nA (which is suitable for the radiotherapy of eye melanoma). Since 2010 we have studied several types of biological and environmental samples trying to check whether a proton beam with such intensity and energy can be used in activation analysis. As a result we have selected the elements which are possible to be determined under the above-mentioned experimental conditions. The rotating target holder enabled us to ensure the same irradiation conditions for samples and standard solutions.

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