



Imprint of CO₂ emission in atmosphere and biosphere on the basis of 14C and 13C measurements

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As is shown in the IPCC (Intergovernmental Panel on Climate Change) report, the observed climate changes are caused, among others, by human activity. Mainly emission of CO₂ to the atmosphere coming from the burning of fossil fuels, can have dire consequences for life on Earth and development of humankind. The report uses, among others, data obtained from isotopic measurements in the biosphere. Measurements of 14C and 13C concentration in modern atmospheric carbon dioxide and biosphere allow the determination of the decrease of the concentration of this isotope. Furthermore, the magnitude of emission to the atmosphere of carbon dioxide not containing the isotope 14C can be estimated on this basis. Such emission stems from fossil fuel combustion – petroleum, natural gas and black coal. A sensitive bioindicator of the emission are annual tree rings. The measurements of 14C concentration in tree ring material using AMS allow to see its seasonal changes.

Trees, treated as an archive of changes in conjunction with information about the isotopic composition of carbon can be used for monitoring of environment as sensitive bioindicators on local, as well as on the global scale. Regular investigations of isotopic composition of carbon in trees have been carried out in the GADAM Centre for the urban areas of both Poland and worldwide. This method can be applied in the study of the emission of CO₂ to the atmosphere and its spatial and temporal distribution connected with the production of energy by power plants based on fossil fuel combustion for the area of southern Poland. Modelling of CO₂ emission using both 14C and 13C carbon isotopes measured in pine tree rings on the background of climatic changes will be presented.

The national ecological policy in the era of global warming requires the manufacturers of energy to get involved in the development of methods suitable for monitoring the state of the environment. Hence, the interest in the area of monitoring the fossil fuel component in CO₂ in our region is rising. The measurements of 14C (by AMS method) and 13C isotopes have been carried out in atmospheric CO₂ and plants in the Gliwice city centre. A high decrease of both isotopes contents and their short-term seasonal changes during the year caused by human impact during the year are observed.