

DUAL-WAVE X-RAY ABSORPTIOMETRY IN MULTIPHASE FLOW METERING

*Yury Cherepennikov¹, Roman Rezaev, Sergei Stuchebrov,
Alexander Wagner*

National Research Tomsk Polytechnic University, Tomsk, Russia

The authors propose a brand new technology named dual wave absorptiometry. This technology, which is a special case of X-ray wave dispersive spectroscopy, can be used for determination of component composition of the media containing limited number of components, for example multiphase fluids, that is topical issue for modern oil and gas industry. A detailed description of the proposed technology is given in the report as well as numerical simulating and experimental results. Nowadays devices for this kind of analysis based on use of gamma radiation produced by radioactive source, e.g. ^{133}Ba , are most common. The main peculiarities of the proposed technology are the use of tunable X-ray source, namely X-ray tube or compact electron accelerator, to produce radiation and a set of crystal monochromators-analyzers for synchronous analysis of the absorption extent for X-ray with different energies. Test experiments have shown that sensitivity of the technology is not less than 0.1% by mass per measurement time equal to 1 second with statistical error of less than 1%. In comparison with existing analogues the proposed technology provides a better accuracy and sensitivity due to a greater flux of the separated energy lines of radiation, which is 2-4 orders higher than the one produced by radioactive sources. Additionally, non-use of radioactive isotopes improves ecological and radiation safety.

¹ Corresponding author: che@scalpnet.ru