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Metal adsorption on thiolate-functionalized gold-coated silicon detectors for the future study of meitnerium chemistry

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In the field of heavy elements, one of the first attempts to use gold-coated silicon was reported during the chemical characterization of element 112, Cn [1]. Better chemical sorption of this element was observed on gold-modified surfaces rather than on non-modified ones. In the case of element 113, Nh, an enhanced reactivity towards gold was observed, which prevented the proper chemical characterization of this element [2]. Thus, a need for new chemically modified silicon detectors has emerged. The purpose of such surfaces is to selectively bind the atoms of interest but with weaker interactions. Meitnerium, which is expected to be a member of Group IX of the periodic table, has never been chemically characterized before. In this project, the adsorption of iridium (meitnerium's lighter homolog), as well as erbium (a non-volatile element) and astatine (a volatile element) on thiolate-functionalized gold-coated silicon detectors have been studied during online cyclotron-based experiments. The poster will discuss the effect of the surface chemical composition, and the detector position in a simple Recoil Transfer Chamber on the yield of radionuclides. Also, the poster will include studies on the self-assembly of the used thiols on gold-coated silicon substrates. The functionalized substrates were characterized via atomic force microscopy, cluster secondary-ion mass spectrometry, X-ray photoelectron spectroscopy, ellipsometry, and neutron activation analysis

References

[1] R. Eichler *et al.*, Nature **447**, 72 (2007).

[2] A. Yakushev *et al.*, Front. Chem. **9**, 1 (2021).