



## **On the use of Laser Ablation Mass Spectrometry (LA-TOF-MS) for the isotopic analysis Palladium deposits.**

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### **Abstract**

Within the France 2030 framework, we are working with our collaborators (Amplitude, BPI France and Orano) on the EPONA project to develop methods for separating palladium-107 ( $^{107}\text{Pd}$ ), a long-lived beta-emitting radioisotope produced as a fission product. This separation is particularly valuable as it could reduce the volume of long-lived nuclear waste and enable the recovery of palladium for high-value industrial applications, such as catalysis or electronics.

Among the isotopic separation methods, AVLIS (Atomic Vapor Laser Isotopic Separation) shows great promise for isotopes like palladium, ones that would be difficult, if not impossible to separate otherwise.

Once ionized with specific lasers, the desired isotope is collected on metallic plates then analyzed using Laser Ablation Time Of Flight Mass Spectrometry (LA-TOF-MS) for the measurement of the process efficiency. This technique is well known to capture the isotopic and chemical composition for the whole mass spectra thereby giving a high analytical resolution and sensitivity. Here, samples with their surface deposits are settled in a vacuum chamber, undergo a controlled ablation with a Nd:YAG pulsed laser to vaporize a thin layer of neutral species. Then, an electron beam produces cations from these vaporized atom and molecules which are accelerated twice before entering the free flight zone. Finally, after a last acceleration the ions arrive at the detector and the signal is processed.

This poster describe the specific instrument (LA-TOF-MS) developed for the purpose of surface deposit isotopic analysis and preliminary results obtained within this palladium purification project.