# High-precision Nd and W isotopic measurements using a Nu TIMS

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High-precision isotopic measurements are necessary to address fundamental questions about the formation of the Earth and its evolution. The most challenging measurements relate to the detection of very small isotopic anomalies generated during the very first phases of Earth's accretion. To this end, two extinct radiogenic systems are particularly interesting: the $^{182}$Hf-$^{182}$W system with a half life ($t_{1/2}$) of only 9 Ma, and the $^{146}$Sm-$^{142}$Nd system with a $t_{1/2}$ of 103 Ma. However, the daughter isotopic ratios ($^{182}$W/$^{184}$W and $^{142}$Nd/$^{144}$Nd) vary by no more than 15 ppm in terrestrial materials [1, 2], requiring measurements with a routine precision better than 5 ppm to be achieved.

The Nu TIMS recently installed at IPGP is equipped with 16 Faraday detectors, connected to 10^11, 10^12 and 10^13 Ω pre-gain amplifier resistors, and a zoom optics system. Such configuration allows the acquisition of multiple static or dynamic measurements for both Nd and W isotope ratios.

Here we report measured values for both Nd and W standard solutions. The JNdi Nd standard was measured on 800 ng loads. Nd measurements were performed using a 5 lines multidynamic setting, and lasted ~ 10 hours. We obtained $^{142}$/$^{144}$Nd = 1.141836 ± 4.4 ppm (2rsd) and $^{143}$/$^{144}$Nd = 0.512094 ± 4.4 ppm (2rsd), which compares favorably to previous published values [3]. The W standard was measured on 1.5 µg loads using a La and Gd activator [4]. Tungsten measurements were acquired using negative ions, a 7 lines multidynamic setting and lasted ~ 15 hours. Measured values are: $^{182}$/$^{184}$W = 0.864866 ± 13 ppm (2rsd) and $^{183}$/$^{184}$W = 0.467137 ± 14 ppm (2rsd) using the method [4] and $^{182}$/$^{184}$W = 0.864854 ± 5.4 ppm (2rsd) using the method [5].

These results demonstrate the capability of the Nu TIMS to determine to a precision better than 5 ppm both Nd and W isotope ratios. The instrument offers the additional benefits of a large number of detectors that can be dynamically connected to different resistors, providing the opportunity to explore high-precision isotopic measurements of other isotopic systems.

[1] Mundl et al. (Science, 2017), [2] Peters et al. (Nature, 2018), [3] Garcon et al. (Chem Geol, 2018), [4] Archer et al. (IJMS, 2017), [5] Touboul (IJMS, 2012).