 MLF Experimental Report	Date of Report 2016/12/20
Project No. 2016A0019 Title of experiment Feasibility study of TOF-PGA analysis on Re-Os dating Name of principal investigator Minghui Huang Affiliation Japan Atomic Energy Agency	Name of person responsible for instrument Yosuke Toh Name of Instrument/(BL No.) BL04 Date of Experiment 2014/04/14-2014/04/19

Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. Name of sample(s) and chemical formula, or compositions including physical form.
Os-1, OsO ₂ , powder sealed in FEP bag, 1.153 mg. Re-1, Re, foil sealed in FEP bag, 0.1163 mg. Re-5OsO ₂ -5, 48.7 μg Re+ 349.4 μg OsO ₂ , powder sealed in FEP bag. Fe, Fe, plate sealed in FEP bag, 11.9 g.

2. Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.
<p>Experimental method</p> <p>In this experiment, the pure Os and Re sample, Os/Re mixed sample and 11.9 g Fe sample were measured by a Ge detector array at ANNRI. The time-of-flight (TOF) prompt gamma-ray spectra were obtained. The isotopes of Os and Re will be identified by the energies of prompt gamma-rays or neutron resonance energies. When the weight of an iron meteorite higher than 1 g, the background in the neutron energy range of 1-50 eV of the TOF spectrum is mainly caused by the neutron capture in Fe. Thus, the background can be estimated using the spectra of 11.9 g Fe sample. The limits of detection (LOD) and limits of quantification (LOQ) of Os and Re in iron meteorites can be deduced from the net counts of most intense gamma-ray or resonance peaks.</p> <p>Results</p> <p>The data is being processed. The preliminary results of TOF analysis are shown below. Figure 1 shows the TOF spectra of Os/Re mixed sample and 11.9 g iron sample. Isotopes ¹⁸⁷Os, ¹⁸⁸Os, ¹⁸⁹Os, ¹⁸⁵Re and ¹⁸⁷Re were observed. The most intense peaks are the 8.96 eV peak of isotope ¹⁸⁹Os and the 2.16 eV peak of ¹⁸⁵Re. For a</p>

2. Experimental method and results (continued)

measurement of 24 h, the LOD is deduced to be 2.4 ppm for Os and 0.7 ppm for Re. The corresponding LOQ is 8 ppm for Os and 2.2 ppm for Re. Therefore, Os and Re in many iron meteorites, such as Nigrillos, Benett, County and Boguslavka are feasible to be quantified by the non-destructive method. The contents of ^{188}Os and ^{189}Os can be well determined and used for Re-Os dating.

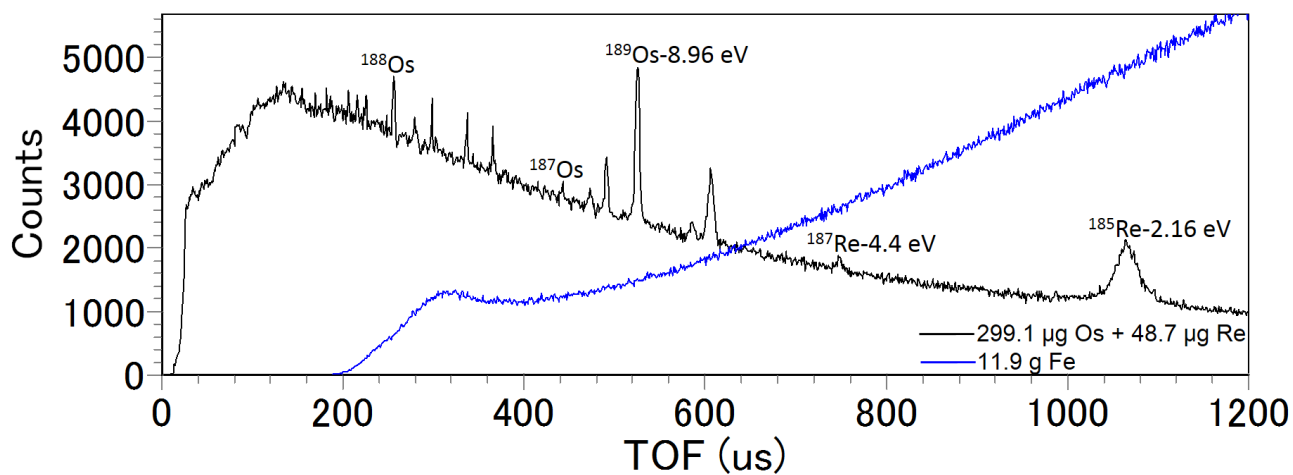


Figure 1 Time-of-flight spectra of the Os/Re mixed sample and 11.9 g Fe sample which were measured for 4 hours each.