# Microanalysis of platinum group elements in terrestrial rocks using synchrotron radiation X-ray fluorescence

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Concentrations and isotopic ratios of platinum group elements (PGEs: Ru, Rh, Pd, Os, Ir, Pt) in the Earth's mantle are strongly controlled by chemical differentiation processes involving both silicate and metallic phases, and therefore they are instrumental for understanding the differentiation and evolution of the Earth's interior. However, interpretation of the geochemical data of PGEs has been equivocal because the main host phases for PGEs in the mantle are not well constrained. PGEs in terrestrial rocks are thought to be concentrated in sulfide and metal minerals that consist mainly of PGEs, but such PGE-bearing phases are generally as tiny as 10 micrometer or less (so called micronuggets), preventing from accurate mineralogical identification or even from finding effectively from mantle-derived samples. Developing a novel method for effective discovery of PGE-bearing micro nuggets in rock samples is necessary for identifying the major hosts for PGEs in the mantle, which in turn essential for understanding the behavior of PGEs in the mantle. In this study, we attempt to find PGE-bearing micro nuggets from mantle-derived rock samples by synchrotron radiation X-ray fluorescence (SR-XRF) microanalysis.

SR-XRF analyses were operated at the beam line BL20XU of SPring-8, Japan. An X-ray beam of 15-113 keV was focused to 2-200 micrometers using a slit or sputtered-sliced Fresnel zone plate, and was applied to rock samples with 0.1-3 mm thickness. X-ray emitted from a sample was detected using a solid-state detector. Using a 15-keV X-ray focused to 10-20 micrometers with 1- to 10-second irradiation, we successfully detected Pt-L lines from several grains of 1-micrometer-size Pt particle, even from behind a 0.1 mm-thick rock slice. Also, we got good element map images with 10-micrometer resolution by scanning samples. We expect that this method will enable effective detection of micrometer-size PGE-bearing micro nuggets from natural rock samples with ˜0.1 mm thickness.