

U-Pb dating of zircon grains from the North Pole Adamellite in the eastern Pilbara Craton

*Hisashi Asanuma¹, Shuhei Sakata², Yusuke Sawaki¹, Kazue Suzuki², Takafumi Hirata³, Shigenori Maruyama¹

1.Tokyo institute of Technology, 2.The University of Tokyo, 3.Kyoto University

Supracrustal rocks around the North Pole Dome, Western Australia provide valuable geological evidences in the early Archean. Since the oldest known microfossils were discovered from chert beds, the North Pole area has attracted interests from many researchers. The stratigraphic section belongs to the lowermost group (Warrawoona Group) in the Pilbara Supergroup, and predominantly consists of greenstone-chert successions that have been well described by previous workers. These successions were mainly dated by U-Pb geochronology of zircon. Thorpe et al. (1992) and Kitajima et al. (2008) reported the U-Pb ages of zircon grains separated from tuffaceous chert, felsic lava, and intrusive adamellite. Most of dated zircons, however, exhibited anomalously high abundance of common lead, and their U-Pb ratios were plotted far away from a concordia curve. These problems should be resolved for better age constraints on the strata in the North Pole area, which is crucial for understanding the timing of the early life evolution on Earth.

In the North Pole area, mafic-ultramafic greenstones are capped by bedded cherts, and include zircon-bearing tuffaceous chert layers and felsic lavas. These successions were regionally uplifted by later adamellite intrusion. This study focuses on the adamellite to determine the crystallization age based on U-Pb geochronology of zircon. We separated and handpicked more than 1000 zircon grains from two adamellites (95NP207 and 96NP208). These zircon grains have euhedral shapes, and also exhibit oscillatory zoning under cathodoluminescence observation. On the other hands, most of the zircon rims are enriched in non-formula elements such as Ca and Al, which indicates that the zircons partially experienced metamictization. In this study, non-metamictized domain in oscillatory zoned zircon was selected for *in-situ* U-Pb analysis, and the U-Pb ratio was measured with LA-MC-ICP-MS at University of Kyoto.

7 and 4 zircons were plotted on the Tera-Wasserburg concordia curve within their analytical errors from 95NP207 and 96NP208, respectively. Moreover these concordant zircons have low contents of common lead ($^{204}\text{Pb}/^{206}\text{Pb}$ values < 0.0005). Based on weight mean $^{207}\text{Pb}/^{206}\text{Pb}$ ages of the concordant zircons, 95NP207 and 96NP208 were respectively dated at 3486 ± 52 Ma and 3449 ± 17 Ma. The larger error of the former data was attributed to two older zircons of 3523 ± 17 Ma and 3567 ± 14 Ma. We concluded that the adamellite intrusion had occurred before 3449 ± 17 Ma, and that the intrusive age gave the minimum depositional age of the greenstone-chert successions in the North Pole area.

Keywords: North Pole area, Paleoproterozoic adamellite, U-Pb zircon dating, Concordia age