Lowest temperature metamorphic diamond in a metapelite from the Nishisonogi unit, Nagasaki Metamorphic Rocks, western Kyushu, Japan.

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This paper reports a new finding of microdiamond aggregates which occur in a matrix of a metapelite within a serpentinite melange at Yukinoura (the Yukinoura melange) from the Nishisonogi unit (85-60 Ma:e.g. Miyazaki et al., 2017), Nagasaki Metamorphic Rocks, a Cretaceous subduction complex located in western Kyushu, Japan. The Nishisonogi unit represents epidote-blueschist facies metamorphic unit consisting mainly of coherent schists (mostly pelitic and psammitic schists with minor amounts of basic schists) with minor serpentinites and metabasites-serpentinite complexes having nature of serpentinite melange. The serpentinite melanges consist of tectonic blocks of various lithologies and sizes embedded in thin actinolite schist matrix (Nishiyama et al., 2017a). The tectonic blocks show various pressure-temperature conditions ranging from 1.5 GPa and 450 C (quartz-bearing jadeitite: Shigeno et al., 2012) to 1.8 GPa and 650 C (garnet-epidote-barroisite rock with cpx and phengite inclusions in garnet).The Yukinoura melange occurs at the westernmost part of the Nishisonogi unit along the Yobukono-Seto Fault that bounds the Nishisonogi unit and the Oseto granodiorite (100 Ma).The latter is overlain by the Tertiary sediments (the Matsushima Group and the Nishisonogi Group) and does not give thermal metamorphism to the Nishisonogi unit (Hattori et al., 1993).

We have reported several occurrences of microdiamond from chromitite (as inclusions in chromite), from pseudotachylyte-like veins in quartz-carbonate rocks, and from pelitic schists (as inclusions in deformed pyrite) in the Yukinoura melange (e.g. Nishiyama et al., 2017b). This time we newly found microdiamond aggregates from a matrix of a pelitic schist. They occur in interstices of phengite and chlorite, and is always associated with carbonate (dolomite, magnesite, and calcite in this order of frequencey) grains. The aggregates show irregular shape of 10 to 50 micrometers in size, consisting of numerous diamond grains embedded in Si-rich mineral (unknown).The diamond shows subhedral to euhedral form with diameter of 0.3 to 0.6 micrometers, which was identified with a SEM-EDS, Raman spectroscopy and TEM. The metapelite occurs in the serpentinite melange, having a mineral assemblage of graphite+chlorite+phengite+albite+quartz+pyrite+pseudomorph after titanite with an estimated temperature of 450 C by the Raman thermometry of graphite. Neither epidote nor lawasonite occurs in the metapelite. The metapelite shows a peculiar feature such that dolomite layers develop parallel to schistosity (S1) and are folded asymmetrically (F2) together with the schistosity. Later dolomite veins cut obliquely these structures. Metapelites outside of the serpentinite melange contain neither dolomite nor microdiamond, although the mineral assemblage is almost the same except participation of garnet and epidote. This is the first report of microdiamond occurrence not only in a matrix of metapelite but also from a subduction zone complex in an island arc setting, indicating deep and cold subduction of the accretionary complex. The diamond formed at the lowest temperature (450 C) condition known in the world. The low temperature is probably the cause of preservation of microdiamond in the matrix, because the activation energy necessary for phase transformation to graphite may not be gained during the exhumation in such a low temperature. Geodynamic significance is addressed such that the ultrahigh-pressure metamorphism reaching to the diamond-stability field can occur not only in a

continental collision zone but also in a subduction zone of island arc setting.

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