

Discovery and Significance of Diamonds in the volcanic-arc type Josephine ophiolite, USA

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Ophiolite-hosted diamonds have been discovered in Mesozoic ophiolites along Neotethyan Orogenic Belt and Paleozoic ophiolites in the Ural-Central Asian Orogenic Belt. These diamonds are interpreted to have initially formed in the mantle transition zone, and then were recycled back to shallow mantle depth via mantle convection or plume upwelling [1]. However, this formational model is still under great debate. The Josephine ophiolite along the eastern Pacific coast in USA is one of the subduction-related volcanic-arc type massifs worldwide. It is the largest ophiolite covering an area of >800km² within the western Klamath terrane. The Josephine ophiolite shows a Penrose-type ophiolitic sequence consisting of harzburgite, cumulated complex, isotropic gabbro, ~1.5 km thick sheeted diorite dikes, ~0.4 km thick pillow lava. Plagiogranites have yielded zircon U-Pb age of 162 Ma. 16 diamond and 13 moissanite grains have been recovered from 518 kg of harzburgites. The diamonds are characterized by small sizes of 40-100 μm, colorless to greenish yellow in color, enohedral to subohedral crystals, octohedral and cubic facies. Recently, ophiolite-hosted microdiamonds have also been recovered from the Taitao ophiolite in Chile [2], the Mayarí-Baracoa ophiolite in Cuba [3] along the eastern Pacific coast, as well as the Horoman peridotite [4] along the western Pacific coast. The issues that why such diamonds appear in the circum-Pacific belt, and what kinds of formation conditions and tectonic evolution process they record are being studied.

References:

[1] Yang J, Wu W, et al. (2021), *Nature Reviews Earth & Environment*, 2(3): 198-212.

[2] Wu W, Yang J, et al. (2023), *Goldschmidt Conference abstract*.

[3] Rui H, Yang J, et al. (2023), *Goldschmidt Conference abstract*.

[4] Li Y, Yang J, et al. (2017), *AGU Fall Meeting abstract*: I51C-I418C.