JADE: OCCURRENCE AND METASOMATIC ORIGIN

[1]HARLOW, G. E. and [2]SORENSEN, S. S. [1]American Museum of Natural History, New York, NY, U.S.A.; [2]Smithsonian Institution, Washington, DC, U.S.A.

True jade refers to two extremely tough, monomineralic rocks used for carvings and gems: Nephrite or tremolite-actinolite [$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$] rock with a felted, microcrystalline habit, and jadeite [$NaAlSi_2O_6$] rock or jadeitite with micro- to macro-crystalline textures. Nephrite is more common with important deposits in British Columbia, Canada; Kunlun Mountains, China; East Sayan Mountains, Russia; Cowell, South Australia; and South Island, New Zealand. Nephrite bodies result from contact and/or infiltration metasomatism of either dolomite by magmatic fluids or silicic rocks by serpentinite fluids. Conditions range from upper-greenschist-amphibolite facies (< 550 °C) in the dolomite-derived type or moderate to low temperatures (~400 to ~100 °C) in ophiolites at moderate to low pressure (<2kbar?). Jadeitite is rarer than nephrite with important deposits in northern Myanmar (Burma); Motagua Valley, Guatemala; Polar Ural and Borus Mountains, Russia; and Itmurundy, Kazakhstan. Jadeitite is very uncommon and only occurs as bodies in subduction-related serpentinite along major fault zones. Rhythmically zoned jadeite crystals in jadeitites indicate crystallization from an aqueous fluid, undoubtedly as veins in host serpentinite. Jadeite indicates high pressure, but absence of coexisting quartz requires pressure only above 5-6 kbar for the low temperature environments (200 to 400 °C). Jadeitite formation requires devolatilization, primarily sediment dewatering, within a subducting slab at depths down to the blueschist-to-eclogite transition, with fluids channeled in serpentinite diapirs rising through faults in a mantle wedge. Thus, most jade deposits record events at convergent margins that involve fluid interactions in and around serpentinizing peridotite.