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AMATERASUITE, A NEW MINERAL FROM JADEITITE, A REPRESENTATIVE STONE OF JAPAN

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Amaterasuite is a new mineral species found in jadeite-rich rock (jadeitite) from the Osayama area, Niimi City, Okayama Prefecture, Japan, and has been approved by the Commission on New Minerals, Nomenclature and Classification of the International Mineralogical Association (Nishio-Hamane et al. 2025). It is characterized by both a unique chemical composition and crystal structure previously unknown in minerals.

Jadeitite, designated as the national stone of Japan by the Japan Association of Mineralogical Sciences, is widely recognized for its scientific importance and cultural symbolism. The discovery of a new mineral within this symbolic rock is therefore meaningful. Moreover, the crystal structure of the mineral exhibits an intrinsic duality, which conceptually resonates with the two-fold nature of divine spirits in Japanese mythology: Ara-mitama (rough spirit) and

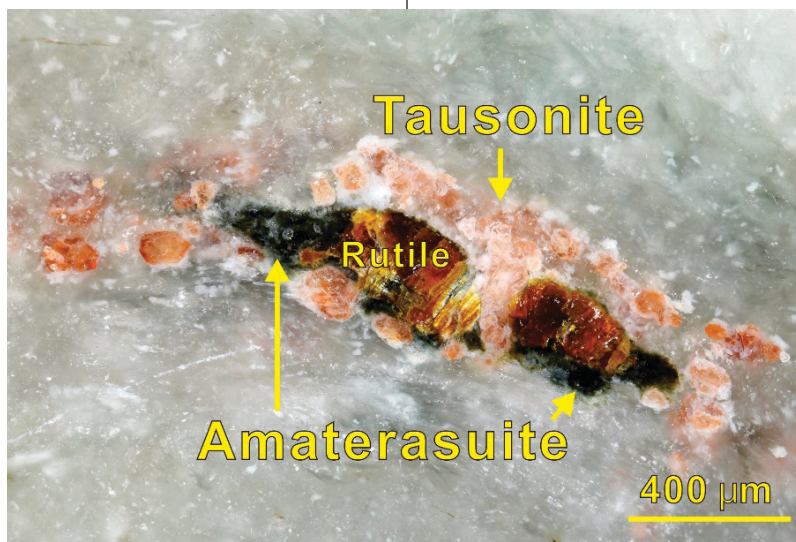


FIGURE 1 Mineral assemblage containing amaterasuite.

Nigi-mitama (gentle spirit). Reflecting this symbolism, the mineral was named “amaterasuite” after Amaterasu Omikami, the most iconic deities in Japanese mythology.

Amaterasuite occurs within jadeitite surrounding rutile and is enclosed by tausonite (FIG. 1). Its chemical formula is $(\text{Sr},\text{Ba})_4\text{Ti}_6\text{Si}_4\text{O}_{23}(\text{OH})\text{Cl}$, representing an unprecedented atomic ratio among minerals. Although a synthetic phase with a similar composition, $(\text{Ba},\text{Sr})_4\text{Ti}_6\text{Si}_4\text{O}_{24}\cdot\text{H}_2\text{O}$, has been reported previously, its crystal structure did not match that of amaterasuite.

The investigation of the synthetic phase, based on order–disorder theory, led to the derivation of two maximum-degree-of-order (MDO) structures (Cadoni et al. 2008). One of these corresponds to a monoclinic $P2/c$ structure (the $2M$ polytype), and the synthetic phase was confirmed to adopt this structure. The other predicted MDO structure is an orthorhombic $Fddd$ structure (the $4O$ polytype), which had not been observed experimentally at that time and remained a purely theoretical prediction. In contrast, amaterasuite was identified as the $4O$ polytype.

Accordingly, amaterasuite represents the first natural realization of a previously hypothetical crystal structure, thereby establishing its status as a new mineral species. The unit cell of amaterasuite consists of two mutually exclusive atomic configurations (types A and B; FIG. 2). These configurations cannot coexist simultaneously within a single unit cell; however, they do coexist on a macroscopic scale, giving rise to an intrinsic structural duality. As a result, in the crystals treated in the analysis, their abundance is statistically represented as site occupancy.

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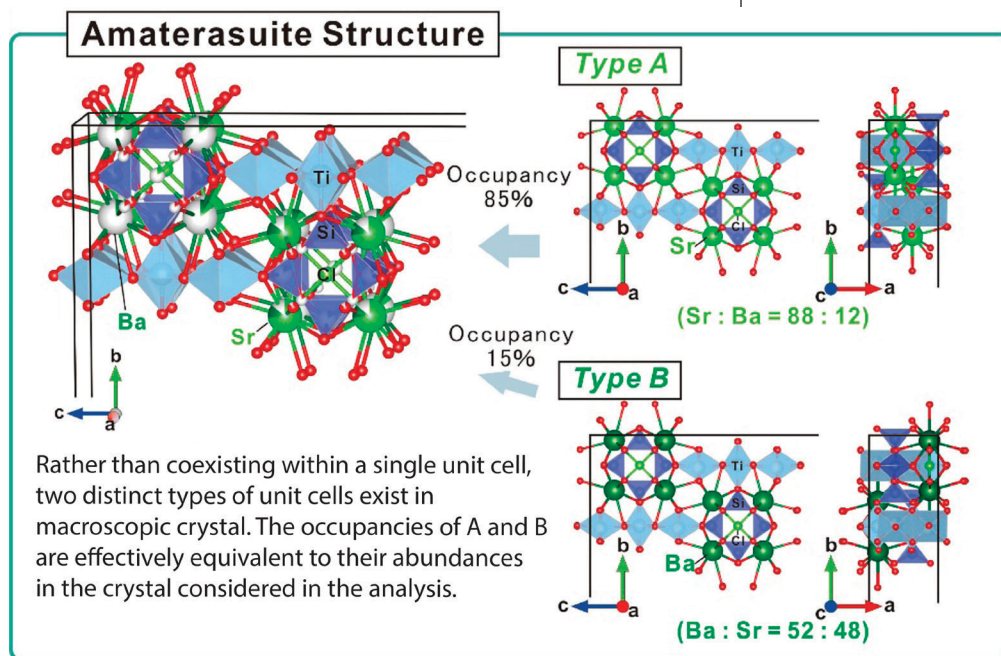


FIGURE 2 Crystal structure of amaterasuite (partial view).

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