Chibaite $SiO_2 \cdot n(CH_4,C_2H_6,C_3H_8,C_4H_{10})$ with n_{max}= 3/17

Crystal Data: Cubic. *Point Group:* $2/m\,\bar{3}$. As equant crystals displaying {111} and {100}; epitaxially intergrown with DOH-type silicate clathrate. *Twinning*: Spinel law.

Physical Properties: *Cleavage*: n.d. *Fracture:* n.d. *Tenacity*: n.d. Hardness = 5.5-7
D(meas.) = n.d. D(calc.) = 2.03(1)

Optical Properties: Transparent to translucent. *Color*: Colorless. *Streak*: n.d. *Luster*: n.d.
Optical Class: Isotropic. *n* = 1.470(1) Anisotropic (uniaxial) domains observed in thin section.

Cell Data: *Space Group: Fd* $\bar{3}$. *a* = 19.3742(3) Z = 136
Cubic and tetragonal domains are epitaxially intergrown and some of the tetragonal domains are most likely oriented with each other as pseudo-merohedral twins.

X-ray Powder Pattern: Arakawa, Minami-boso City, Chiba Prefecture, Japan.
3.276 (100), 3.730 (91), 5.847 (83), 5.596 (46), 3.426 (40), 6.858 (38), 3.956 (25)

Chemistry:
(1) Arakawa, Minami-boso City, Chiba Prefecture, Japan; electron microprobe analysis, supplemented by Raman spectroscopy; no analysis provided, excluding guest molecules corresponds to $Na_{0.99}(Si_{134.53}Al_{1.63})O_{272}$; CH_4, C_2H_6, C_3H_8, and *i*-C_4H_{10} molecules detected by Raman analysis ascribed to guest molecules in the structural cages.

Occurrence: As veins cutting tuffaceous sandstone and mudstone in forearc marine sediments deposited near the plate margin of the Paleo-Izu arc and the triple junction of the Pacific, Philippine Sea, and North America plates.

Association: DOH-type silicate clathrate, calcite, quartz, opal-A, pyrite, epistilbite, clinoptilolite.

Distribution: From the Hota Group or Emi Group marine sediments, Arakawa, Minami-boso City, Chiba Prefecture, Japan.

Name: For the *Chiba* Prefecture in Japan where the first samples were collected.

Type Material: Mineral Collection, Tohoku University Museum, Sendai, Japan (A-151).

References: (1) Momma, K., T. Ikeda, K. Nishikubo, N. Takahashi, C. Honma, M. Takada, Y. Furukawa, T. Nagase, and Y. Kudoh (2011) New silica clathrate minerals that are isostructural with natural gas hydrates. Nature Communications, 2, Article 196, 1-7. (2) (2012) Amer. Mineral., 97, 2066 (abs. ref. 1).