

Salt Weathering in the Yoshimi Hyaku-Ana Historic Site: Seasonal Changes in Salt Crystallization and Debris Formation

Chiaki T. Oguchi[1]; Yasuhiko Takaya[1]; Mai Yamazaki[2]; Ryohei Ohnishi[2]; Thidar Aye[3]; Swe Yu[3]; Tamao Hatta[4]

[1] GRIS, Saitama Univ.; [2] Civil Eng., Saitama Univ.; [3] School Sci. & Eng. Saitama Univ.; [4] JIRCAS

<http://www.saitama-u.ac.jp/gris/>

We investigated wall surfaces of an artificial cave in the historic site of Yoshimi Hyaku-Ana, Saitama Prefecture. The artificial cave was dug during World War II for keeping weapons and suffering from severer salt efflorescence of sulfate salts. We set up twelve investigation points on walls in the artificial cave. Points 1 to 4 are located in corridor A, points 5 to 8 are in corridor B, and points 9 to 12 are in corridor C. Corridor B runs perpendicular to corridors A and C which run straight from two cave entrances to the inside. Three data loggers for collecting hourly temperature and air humidity near the walls were set up at points 2, 8 and 12. Fallen salts and debris at each point were collected monthly from November 2008 to December 2009. Main salt minerals, detected by XRD, are hard and granularly effloresced alunogen ($\text{Al}_2(\text{SO}_4)_3 \cdot 17\text{H}_2\text{O}$) on the walls near the entrances (Points 1, 2, 11 and 12), and gypsum was found on the inside walls of points 5 to 8 in the humid summer. On the contrary, powderly effloresced halotrichite ($\text{FeAl}_2(\text{SO}_4)_4 \cdot 22\text{H}_2\text{O}$), sodialum ($\text{NaAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$) and epsomite ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$) were detected in the dry winter. Jarosite ($\text{KFe}_3(\text{SO}_4)_4 \cdot (\text{OH})_8$) minerals were observed on iron hydroxide stains on the walls in every season. The amount of salts and debris from the wall of corridor B (points 5 to 8) were greater than those from the other corridors. Therefore, halotrichite, sodialum and epsomite damaged the walls most severely especially in the dry winter.