



Title	Acid mine drainage sources and hydrogeochemistry at the Yatani mine, Yamagata, Japan: A geochemical and isotopic study
Author(s)	Tomiyama, Shingo; Igarashi, Toshifumi; Tabelin, Carlito Baltazar; Tangviroon, Pawit; Ii, Hiroyuki
Citation	Journal of contaminant hydrology, 225, UNSP 103502 <a href="https://doi.org/10.1016/j.jconhyd.2019.103502">https://doi.org/10.1016/j.jconhyd.2019.103502</a>
Issue Date	2019-08
Doc URL	<a href="http://hdl.handle.net/2115/82319">http://hdl.handle.net/2115/82319</a>
Rights	© 2019. This manuscript version is made available under the CC-BY-NC-ND 4.0 license <a href="http://creativecommons.org/licenses/by-nc-nd/4.0/">http://creativecommons.org/licenses/by-nc-nd/4.0/</a>
Rights(URL)	<a href="http://creativecommons.org/licenses/by-nc-nd/4.0/">http://creativecommons.org/licenses/by-nc-nd/4.0/</a>
Type	article (author version)
Additional Information	There are other files related to this item in HUSCAP. Check the above URL.
File Information	Highlights and Abstract Tomiyama_190328.pdf



[Instructions for use](#)

**Highlights:**

- ✧ The Yatani mine has been generating acid mine drainage (AMD).
- ✧ AMD is formed through interactions between groundwater and sulfide minerals.
- ✧ The groundwater recharge area is located on the mountain slope of ~900 m.
- ✧ AMD formation in the drifts and shaft is pronounced.

1 **Abstract**

2 This paper describes the geochemistry of groundwater and its flow system in the  
3 closed Yatani mine in southern Yamagata Prefecture, Japan. The mine is located in a  
4 sulfide deposit containing pyrite and has been generating acid mine drainage (AMD).  
5 The study was intended to elucidate the formation of AMD and its flow patterns using  
6 geological, hydrological, geochemical, and isotopic techniques. The results indicate that  
7 AMD is formed by the interaction of groundwater with sulfide minerals, sand slime, and  
8 tailings back-filled into excavated mine areas. Groundwater recharge areas were  
9 identified on the mountain slope at an elevation of ~900 m. The formation of AMD in  
10 the drifts and shaft was more extensive than that in the deeper drainage levels. Principal  
11 component analysis was applied to the hydrogeochemical data to identify the causes of  
12 AMD formation. The first, second, and third principal components reveal that the  
13 increased ion concentrations in mine drainage are a result of water–mineral reactions in  
14 excavated mine areas, the contribution of groundwater in deep reductive environments,  
15 and isotopic fractionation during precipitation, respectively. A promising method of  
16 reducing AMD formation is to prevent contact between dissolved oxygen and sulfide  
17 minerals by increasing the drainage level or by filling the shallow underground  
18 excavated area with cementitious materials.

19

20 **Keywords:** Abandoned and closed mine, Acid mine drainage (AMD), Groundwater  
21 recharge, Geochemical modeling

22

23