Find a Better Way to Neutralize Acid Mine Drainage

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Recently, the effects of acid mine drainage (AMD) on our life and the stream aquatic environments have become severe. AMD is recognized in the various areas in the world, such as Africa, North America, Europe and Oceania. This environmental problem is caused by pollution linked to the development of many kinds of mines including iron and even coal. When mines are established, the metal ions — iron, aluminum, copper, mercury, and so on — dissolve in the river water and acidity rises. This contaminated strongly acidic water also contains toxic metals, so flooding AMD into the environment is bad for those creatures in the river and nearby, as well as for humans using this water. So, we are trying to develop low-cost ways to treat AMD to reduce the effects. Limestone is known to neutralize AMD by dissolving into acid, thereby releasing bicarbonate and resulting in iron and other metals to precipitate. However, the precipitation of iron adheres to the limestones (armoring), and therefore, limestones do not work well. In previous research, it was found that adding sandstone can prevent the armoring of limestone. Sandstone is armored faster than limestone due to the difference in surface chemistry. The goal of this research is to determine if there is a limit of the effect of sandstone, and to determine what will happen if we perform the experiment in a situation closer to the natural environment. Previous experiments with sandstone were consecutively conducted over four timepoints to simulate a passive trench where limestone would be repeatedly exposed to fresh AMD. However our research will extend this to more than eight timepoints. As in the previous experiment, we will use two different types of sandstone: quartz-cemented-sandstone and Garber sandstone. We used the same limestone and sandstones throughout each experiment so that we could determine the change of surface situation over time. Our results indicate that the limestone-only experiments took longer to get neutralized compared to with-sandstone experiments, but all experimental groups were slower to get neutralized. The data suggests that there is a limit of the ability of sandstone and sandstones only help a little to promote AMD neutralization.