Evolution of hydrogeochemical problems in Merzifon (Amasya, Turkey) aquifer with GIS

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Groundwater level in the Merzifon (Amasya, Turkey) aquifer has been decreased in recent years because number of wells and over pumping. Some of these wells are used for irrigation and some of are used for drinking purposes. Groundwater bearing alluvium consisting of loose gravel, sand and silt in the Merzifon-Gümüşhacıköy Basin is Plio-Quaternary aged.

Hydrogeochemical studies were conducted to establish groundwater and surface water quality in the Merzifon Aquifer. Mean pH value is 7.61, EC value is 67.59 and TDS value is 376.86 of the groundwater and surface water samples according to the analyze results. The trace element results especially Mn, Cr, Zn, As, Ni and Co are very high values in surface waters in the south of aquifer that is recharge area. Nitrate values are so high and a lot of water samples have below the limits in the aquifer.

To prevent exhausting groundwater in Merzifon Aquifer, groundwater usage should be regulated, and uncontrolled groundwater use must be terminated. Groundwater must be exploited with optimum discharge rate, must not be exceeded maximum rate. Besides, pollutants should be studied which parameters cause groundwater contamination and pollutant factors should be analyzed in water springs with intermittently.

Can we learn about bacterial attachment at mineral surfaces through colloid adsorption experiments?

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Colloid-surface interactions are mainly governed by electrostatic and van der Waals interactions. Nevertheless, surface topography variations on the micrometer and nanometer scale are able to alter significantly the local interaction potential. The resulting variations in the interaction energy at small separation distances may change the general interaction behaviour. Particle retention has been observed for mineral surfaces that are thought to be unable to act as collectors [1], and there is still no fundamental quantitative understanding and predictability for such phenomena. A predictive capability would be particularly important in colloid-mediated transport of radioactive material and the particle retention efficiency of barrier rocks.

Bacteria may be considered as “living particles” in the size range of large mineral colloids. Bacteria are able to modify surface area and topography of mineral and rock surfaces by corrosion. The formation of etch pits by bacteria is an important example that illustrates how bacteria govern and alter quantitatively the kinetics of mineral dissolution [2] and, consequently, the surface energy potential. Here we explore the interaction potential between well-defined surface topographies and microbes. Machined silica surfaces with building blocks in the micron to submicron scale are utilized [3]. The applied pattern results in well-defined variations of the surface energy potential. We apply this variability to study the near-field behaviour of microbes at structured mineral surfaces, i.e., the first step of microbial attachment to surfaces. Analyses using vertical scanning interferometry show the variability of microbial attachment to natural surfaces and provide quantitative constraints to these initial mineral-microbe interactions. The competition in surface interaction between “living” and “dead” colloids may provide the key to understand and predict the variability in surface reaction kinetics that is observed in nature.

[1] Fischer *et al* (2012) *Amer. J. Sci.* **312**, 885-906. [2] Lüttge *et al* (2005) *Amer. J. Sci.* **305**, 766-790. [3] Darbha *et al* (2012) *Langmuir* **28 (16)**, 6606-6617.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.6