Was There Water on Mars Long Enough for the Origination of Life?

October 18 2006

Based on the lovely green rock, olivine, also known as the gemstone, peridot, a Virginia Tech graduate student has created a mineral lifetime diagram that provides the a clue to when and for how long there might have been water on Mars.

Amanda Albright Olsen of Altoona, Pa., a doctoral student in geosciences at Virginia Tech, will present the research at the Geological Society of America national meeting in Philadelphia Oct. 22-25. Virginia Tech Geosciences Professor Donald Rimstidt of Christiansburg, Va., is co-author.

Olivine, a silicate mineral rich in magnesium and iron, is found on earth in volcanic rock (basalts). It has also been spotted on Mars – most recently and in significant amounts by NASA's Mars Odyssey spacecraft (Geology, June 2005). Because life requires liquid water and because olivine dissolves in water, Olsen set out to establish how long it takes olivine to dissolve. The answer could help scientists determine if there was liquid water on Mars long enough for life to develop.

“Our goal is to produce a robust analysis of olivine dissolution that can be used to predict olivine grain lifetimes,” Olsen said.

She used published information and laboratory studies to construct a baseline model, and introduced controlling factors, such as pH and temperature. Since environmental factors have often resulted in slower dissolution rates in the field than in the lab, she compared her results

with an analysis of olivine in natural environments by Virginia Tech Geoscience Professor Michal Kowalewski and Rimstidt (2003), who determined average mineral grain lifetimes based on radiometric dates.

Olsen and Rimstidt's conclusion is that the Martian olivine could take between slightly less than a million years to as long as many millions of years to dissolve in water. She cautions that pH is a highly controlling factor and a more precise estimate awaits information on the chemical conditions on the Mars surface.

"Amanda's research will be a tool to help others pin down it down," Rimstidt said.

"Regardless of what physiochemical conditions that we postulate for early Martian history, we can now propose a scenario and ask, "Is it reasonable to expect that life could have originated in this time frame?" Olsen said.

Source: Virginia Tech