

Dr. Stephen D. Kinrade



Lakehead University Research Chair in Aqueous Silicon Chemistry

Department of Chemistry

Start Date: 2008

Website: <http://www.chemistry.lakeheadu.ca/personal/kinrade.htm>

Key Words Describing Areas of Research

silicon, silicates, siloxanes, zeolites, cement, biomineralization, bone, nutrition

Understanding aqueous silicon

Dr. Stephen Kinrade is unravelling mysteries about a substance that is all around us and even part of our own chemical makeup. Silicon is an omnipresent element, found in water, soil, plants and animals. Combined with oxygen, it forms the silicate minerals that constitute the earth's crust. As the minerals dissolve, they release silicic acid which is taken up by plants to help them defend against disease and other stresses. Similarly, mammals require silicon in their diet to maintain healthy growth of connective tissue. The research team led by Dr. Kinrade has made significant inroads towards understanding the fundamental chemistry of aqueous silicon along with the mechanistic role it plays in geology and biology. One of their discoveries - silicon's chemical interaction with certain sugars and sugar derivatives - was published in 1999 in the journal *Science* and jumpstarted a new field, silicon biochemistry; they subsequently found evidence of such interactions occurring in a simple living organism. The team has characterized the uptake and chemical speciation of silicon within both plants and humans, and determined the influence exerted by degradation products of silicone rubber on the health of wheat plants and human bone cells. Additionally, their work has contributed to technological advances in cement, paper manufacturing, catalyst development, and treatment of industrial waste.