The Clay Minerals Society

www.clays.org

THE PRESIDENT'S CORNER

The Science and Politics of Global Climate Change

As Earth scientists, we know that climate is dynamic, vacillating between glacial and interglacial epochs in the most recent geological time. Climate scientists have strong empirical evidence, climate-physics-based theories, and reasonably robust general circulation models describing the interactions among climate-forcing and climate-feedback factors that control these vacillations. Through the Pleistocene, atmospheric levels of CO_2 functioned largely as a climate-feedback factor lagging behind temperature change, because as the climate warmed, CO_2 was exsolved from the oceans, and when the climate cooled, greater amounts of CO_2 were absorbed by the oceans. Recently some political pundits have tried to use the lag between changes in atmospheric CO_2 concentrations and changes in temperature to argue that changes in atmospheric CO_2 concentrations are an effect of climate change and not a cause. The truth is that changes in atmospheric CO_2 concentrations are both a cause and an effect. Furthermore, the recent dramatic increase in atmospheric CO_2 concentrations caused by the burning of fossil fuels and land-use changes has transformed atmospheric CO_2 from a climate-feedback to a climate-forcing agent.

We know that the Earth's climate is changing rapidly, but there is little detailed knowledge about the extent and direction of climate change in specific regions and even less understanding of the ability of human societies and economies to adapt to climate change. Given the prospect of adverse short-term economic outcomes that would result from the implementation of proposed climate change mitigation policies and the vagueness of future climate change impact predictions, it is politically safer for many politicians to justify doing nothing by questioning the validity of climate change rather than take decisive action to address climate change.

An Economically Viable Option for Addressing Climate Change

No one technology will solve climate change; however, fast pyrolysis of agricultural and forestry residues and biomass from dedicated bioenergy crops has the potential to be an economically viable means of removing CO_2 from the atmosphere. When biomass is heated to ~500 °C in the absence of oxygen, it thermally depolymerizes, producing syngas, bio-oil, and biochar coproducts. Syngas is a low-energy-density, combustible gas that can be used to supply the energy needs of the pyrolyzer. Bio-oil, which has about half the energy density of petroleum, can be refined to produce liquid transportation fuels. Biochar can be burned as a solid fuel, but is better used as a soil amendment to recycle nutrients harvested with the biomass, build soil quality, and sequester carbon. The half-life of biochar carbon in soils is estimated to be on the order of a thousand years; thus from a practical perspective an integrated pyrolysis-bioenergy-biochar-agriculture industry has the potential to generate liquid transportation fuels that, on net, are carbon negative.

The Paradigm Shift

Until now, governments have been unable to take effective action to address climate change, as short-term economic concerns are far more pressing than long-term environmental issues. Private industry development of a global pyrolysis-biochar industry would circumvent the political gridlock and maybe even change the acrimonious political dialog swirling around climate change.

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2012 CMS AWARDEES

The following awards were presented at the CMS annual meeting held in Golden, Colorado, in June. Details of the awardees' presentations will appear in the October issue of *Elements*.

The Marilyn and Sturges W. Bailey Distinguished Member Award was presented to **Dr. Akihiko Yamagishi**, visiting professor, Toho University, Japan. Dr. Yamagishi's research involves the stereochemical effects on the adsorption of chiral metal complexes by clays. He has combined the synthesis of chiral amphiphilic transition metal ion complexes with their ion exchange on smectite surfaces and detailed spectroscopic and quantum-chemical studies of their organization at the smectite surfaces. He was the first to show that racemic and chiral forms of these complexes bind differently in the interlayer space of clay minerals. Dr. Yamagishi also introduced the Langmuir-Blodgett technique in clay mineral science, allowing detailed spectroscopic analysis of single-layered smectite nanosheets and forming the basis for the preparation of a new range of optical materials and sensors.

Dr. Jeffrey Post, curator of the mineral and gem collection Smithsonian Institution, U.S. National Museum of Natural History, received the Marion L. and Chrystie M. Jackson Mid-Career Clay Scientist Award. Dr. Post's research has centered on the crystal chemistry of Mn and Fe oxides, and he helped pioneer the application of whole-pattern X-ray diffraction techniques to poorly crystalline oxide and clay minerals. He has also applied synchrotron X-ray and neutron sources to reveal the structures of a host of important soil minerals, including todorokite, birnessite, akaganéite, and sepiolite/palygorskite. His ongoing contributions prove the vitality of X-ray crystallography in clay geochemistry when diffraction techniques are applied with consummate expertise.

THE 50th ANNIVERSARY ANNUAL MEETING OF THE CLAY MINERALS SOCIETY

- October 6–10, 2013, University of Illinois, Urbana, Illinois, USA
- Technical Sessions and Symposia
- Premeeting workshop: "Advanced Applications of Synchrotron Radiation in Clay Science"; includes a visit to the Advanced Photon Source at Argonne National Laboratory
- Field trips: "Starved Rock and Matthiessen State Parks," "Fithian Illite and Morrow Plots," and "Urbana Moraine"
- Accompanying member tours: "Abraham Lincoln Historical Sites and Museum" and "Amish Country"
- Organizing Committee: Joseph W. Stucki, Stephen Guggenheim, Stephen P. Altaner
- Abstracts and early registration deadline: June 1, 2013

Information: jstucki@illinois.edu

UPCOMING ARTICLES IN *CLAYS AND CLAY MINERALS*

Influence of synthesis conditions on the formation of kaolinite-methanol complex and simulation of its vibrational spectra – Jakub Matusik, Eva Scholtzová, and Daniel Tunega

Clay mineralogy of the Zhada sediments: Evidence for climatic and tectonic evolution since ~9 Ma in Zhada, southwestern Tibet – Hanlie Hong, Chaowen Wang, Zeng Kefeng, Kexin Zhang, Ke Yin, and Zhaohui Li