**Materials of a Habitable Planet**

**Professor Jung-Fu Lin, Department of Geological Sciences and Texas Materials Institute**

**The University of Texas at Austin**

30 hrs of lectures-course

This course will discuss a habitable planet from the viewpoint of physics and chemistry of geomaterials in various forms and thermodynamic conditions. Planetary and lab-grown materials are the building blocks and foundation of our human societies so there’s much interest in learning how materials naturally evolve in spatial and temporal scales and how to synthesize and characterize novel materials. This course is intended to be interdisciplinary to build bridges for students in physics, geoscience/geology, material science, engineering and chemistry.

In the lectures, we will learn the basics of element condensation and crystallization to form crystals and minerals; two and three-dimensional lattice arrangements and their physical manifestations in atomic scales; the roles of pressure-temperature-compositional thermodynamic variables on phase transitions and properties of materials; discovery, synthesis and characterizations of novel materials; key ingredients and sources for a habitable planet. We will introduce modern analytical techniques in laser and synchrotron X-ray spectroscopic techniques and use newly discovered materials as examples to illustrate “materials of tomorrow”.

This course will help us appreciate planet Earth and think about the sustainability of a habitable planet into the future. The course will cover the following topics, but not limited to:

* Introduction to geomaterials of a habitable planet
* Origin and formation of planetary and lab-grown materials
* Physics and chemistry of geomaterials and synthetic matters
* Crystallography and evolution of geomaterials
* Basic knowledge of thermodynamics driving a habitable planet
* Modern techniques for characterizations of materials



Picture illustrates the habitable planet Earth with surface geomaterials and civilization. Sunlight on the horizon hints to discoveries of potential habitable exoplanets.

**Short biography about Prof. Jung-Fu “Afu” Lin**

Afu Lin is a Taiwanese American living in Austin, Texas since 2008. He is now a full professor at Department of Geological Sciences and Texas Materials Institute at the University of Texas at Austin. Prof. Lin finished his PhD degree in geophysics from the University of Texas at Austin in 2002. Dr. Lin was a Carnegie Postdoc Fellow in Carnegie Institution for Science in 2002-2005 and a Lawrence Livermore Fellow at Lawrence Livermore National Laboratory, California in 2005-2008. His research interest focuses on studying and discovering materials at extreme pressure and temperature conditions using laser and synchrotron X-ray spectroscopic techniques. His research results are applied to understand geophysics and geodynamics of Earth’s interior and other planetary bodies as well as to search for novel materials with unique properties. He has published more than 200 papers in peer-reviewed journals including Nature, Science, Nature Geoscience, Nature Materials, and Phys. Rev. Lett. Prof. Lin is a Fellow of the Mineralogical Society of America and a Fulbright Scholar to Adam Mickiewicz University, Poland.