

## **T. Don TILLEY, Professor**

Department of Chemistry  
University of California, Berkeley  
Berkeley, California 94720-1460, USA.  
Tel: 1(USA)-510-642-8939, FAX 1-510-642-8940  
E-mail: tdtalley@berkeley.edu



### **Education**

Ph.D. Chemistry (1982): University of California, Berkeley,  
B.S. Chemistry (1977): University of Texas, Austin

### **Academic Career**

1981-1983: Postdoctoral research with Profs Grubbs and Bercaw (Caltech)  
and Profs Pino and Venanzi (ETH, Zürich) in a US-Swiss program  
1983-1988: Assistant Professor, Department of Chemistry, UC San Diego  
1988-1990: Associate Professor, Department of Chemistry, UC San Diego  
1990-1994: Professor, Department of Chemistry, UC San Diego  
1994- : Professor, Department of Chemistry, UC Berkeley  
1994- : Senior Faculty Scientist, Lawrence Berkeley National Laboratory

### **Awards and Honors**

Alfred P. Sloan Research Fellowship (1988-1990), Union Carbide Innovation Recognition Awards (1991, 1992), Japan Society for the Promotion of Science Fellowship (1993), NSF Creative Research Extensions (1993, 2001, 2004), Visiting Professor, ETH, Zürich, Switzerland (1998), Alexander von Humboldt Award for Senior Scientists (1998), American Association for the Advancement of Science Fellow (1998), Visiting Professor, University of Montpellier, France (1999-2000), ACS Award in Organometallic Chemistry (2002), Wacker Silicon Award (2003), Miller Research Professorship (2004-5), Centenary Lectureship and Medal, Royal Society of Chemistry (2007), ACS Frederic Stanley Kipping Award in Silicon Chemistry (2008), Visiting Professor, University of Strasbourg, France (2010).

### **Total Publications**

363

### **Research Interests**

The research group is generally interested in synthetic and mechanistic problems in inorganic, organometallic, and materials chemistry. Efforts in organometallic chemistry and homogeneous catalysis target the discovery of new types of metal-containing structures, and fundamentally new chemical transformations. A particular area of emphasis has been the study of transition metal-main group complexes and catalytic element-element bond formations. In addition, fundamental C-H and N-H bond activations are investigated within the context of new catalytic cycles. Molecular precursors to solid state materials of controlled structure and composition, and to surface-bound catalytic centers, have also been developed. The latter approach, among others, is currently being investigated for development of catalytic systems for solar-to-fuels applications. Finally, the exploration of new synthetic methods for the construction of conjugated organic materials targets charge-transporting systems for electronic applications.

# Sustainability in Catalytic Chemistry: The Case of Hydrosilylation

T. Don Tilley<sup>1,2</sup>

<sup>1</sup>*Department of Chemistry, University of California, Berkeley, Berkeley, California 94720-1460, USA;* <sup>2</sup>*Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA*  
tdtilley@berkeley.edu

The hydrosilylation of alkenes is a widely practiced catalytic transformation, and is of great importance for the production of organosilanes and materials based on poly(siloxane)s. For industrial applications, the most common and active hydrosilylation catalysts are based on platinum, and to a lesser degree other precious metals. Due to the high cost associated with such metals, there is increasing interest in utilization of less expensive first-row transition metal catalysts for this transformation. In addition, there are a number of challenges regarding development of more environmentally benign, and more selective catalysts of this type. A general approach for addressing these issues involves discovery of fundamentally new metal-mediated transformations. Such reactions, which could also enable access to new silicon-based compounds and materials, may be identified by investigations of potential intermediates that may result from interactions of silicon species with metal complexes, and on novel fundamental reaction steps for activations of substrates. Along these lines, it appears that new types of hydrosilylation catalysts may be based on unsaturated metal-silicon species (metal silylene complexes). This chemistry utilizes a fundamental bond activation process involving the migration of a substituent from a donor atom to the metal. Such migrations may be coupled with oxidative addition to provide the direct conversion of a free silane to a silylene complex. Much of our work has focused on the chemistry silylene complexes, and how these species might mediate new chemical transformations. A number of additional species that feature intramolecular Si-H interactions may also play a role in new transformations of interest. Within these contexts, mechanistic, reactivity and catalytic studies will be described.