



## Transition Metal–Silicon Chemistry in Bond Activations and Chemical Transformations

T. D. Tilley<sup>[a]</sup> and R. C. Handford<sup>[a]</sup>

<sup>[a]</sup> Department of Chemistry, University of California, Berkeley, Berkeley, California, USA 94720

Given the economic importance of silicon-based polymers, coupling agents, and chemical reagents, it is of interest to develop new and more efficient transformations involving silicon-element bonds. In this respect, transition metals have already played a central role in the inception and growth of the organosilicon industry. For example, the Direct Process enables the silicones industry by utilizing a copper silicide catalyst to convert elemental silicon and MeCl to the Me<sub>2</sub>SiCl<sub>2</sub> monomer. Analogously, various transition-metal silicide nanoparticles are used to mediate the reverse chemical process, to grow silicon nanowires *via* decomposition of molecular silane species at the silicide surface. Another important silicon-carbon bond-forming reaction, olefin hydrosilylation, provides specialty monomers and cross-linked silicone polymers, and employs platinum-based catalysts. Because this reaction is also practiced on a very large scale and is perceived as unsustainable given its reliance on platinum, there is a strong need for alternative catalysts. Consistently, there is long-standing interest in transition-metal silicon chemistry and reactive structures that may serve as intermediates in new or more efficient catalytic transformations. Among these are Si–H sigma complexes, complexes with multiple bonds between a metal and silicon, and complexes with only metal-silicon bonds (silicides). This presentation will focus on the synthesis of such compounds and explorations of their chemical properties, including new catalytic pathways that utilize these structures.

### References

1. R. C. Handford, P. W. Smith, T. D. Tilley, *J. Am. Chem. Soc.* **2019**, *141*, 8769–8772.
2. R. C. Handford, T. Nguyen, S. Teat, R. Britt and T. D. Tilley, *J. Am. Chem. Soc.* **2023**, *145*, 3031–3039.