

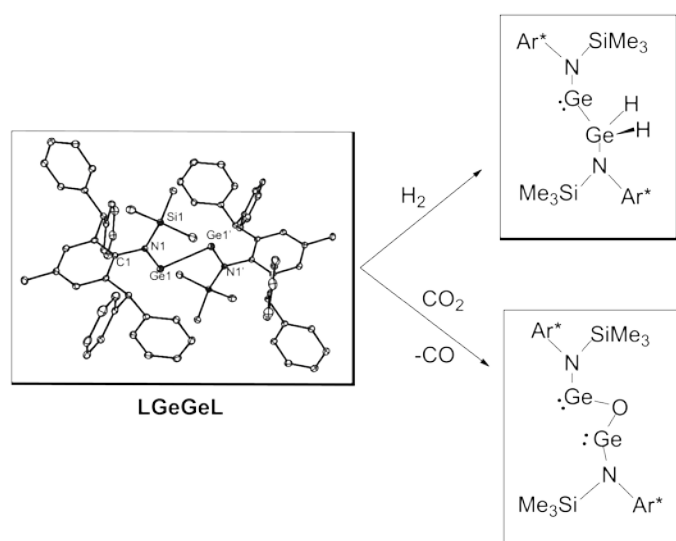
The Activation of E-H Bonds (E = H or C) by an Amido-Digermine with a Ge-Ge Single Bond

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The activation of hydrogen (H₂) (either homolytically or heterolytically) has been extensively examined by both experimentalists and theoreticians, as this process has versatile applications to synthesis, catalysis and energy storage [1]. Previously, transition metal based complexes were widely applied as catalysts to activate H₂. However, since 2005, main group element based complexes have emerged which can activate H₂ and other small molecules under mild conditions [2]. Such advances highlight the potential for main group systems to replace expensive, toxic transition metal compounds in many processes reliant on H-H bond activations. We present recent results concerning the synthesis of the first singly-bonded amido-digermine, LGeGeL (*d*_{Ge-Ge} = 2.7 Å) [3]. The subsequent reactivity investigations



indicate that LGeGeL is quite reactive towards gas molecules. For example, H₂ can be activated unprecedentedly by LGeGeL in either solution or the solid state at low temperature (-10°C). Moreover, LGeGeL is the first example of low oxidation state germanium compound that can reduce CO₂ to CO quantitatively at -40°C [4].

Fig. 1. Reactions of LGeGeL and H₂ or CO₂ (Ar* = C₆H₂{C(H)Ph₂}₂Me-2,6,4).

- [1] K. Gregory J, *Journal of Organometallic Chemistry* **2009**, 694, 2648-2653.
- [2] (a) A. L. Kenward, W. E. Piers, *Angewandte Chemie International Edition* **2008**, 47, 38-41; (b) D. Bourissou, O. Guerret, F. P. Gabbaï, G. Bertrand, *Chemical Reviews* **1999**, 100, 39-92; (c) G. H. Spikes, J. C. Fetting, P. P. Power, *Journal of the American Chemical Society* **2005**, 127, 12232-12233; (d) Y. Peng, M. Brynda, B. D. Ellis, J. C. Fetting, E. Rivard, P. P. Power, *Chemical Communications* **2008**, 6042-6044; (e) D. W. Stephan, G. Erker, *Angewandte Chemie International Edition* **2010**, 49, 46-76; (f) G. C. Welch, R. R. S. Juan, J. D. Masuda, D. W. Stephan, *Science* **2006**, 314, 1124-1126.
- [3] J. Li, C. Schenk, C. Goedecke, G. Frenking, C. Jones, *Journal of the American Chemical Society* **2011**, 133, 18622-18625.
- [4] J. Li, M. Hermann, G. Frenking, C. Jones, *Angewandte Chemie International Edition* **2012**, 51, 8611-8614.