

Special Topics

Dipodal Silanes

Functional dipodal silanes and combinations of non-functional dipodal silanes with functional silanes have significant impact on substrate bonding, hydrolytic stability and mechanical strength of many composites systems. They possess enabling activity in many coatings, particularly primer systems and aqueous immersion applications. The effect is thought to be a result of both the increased crosslink density of the interphase and a consequence of the fact that the resistance to hydrolysis of dipodal materials (with the ability to form six bonds to a substrate) is estimated at close to 100,000 times greater than conventional coupling agents (with the ability to form only three bonds to a substrate).

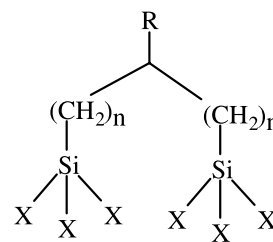
Both because dipodal silanes may not have functional groups identical to conventional coupling agents or because of economic considerations, conventional coupling agents are frequently used in combination with a non-functional dipodal silanes. In a typical application a dipodal material such as bis(triethoxysilyl)ethane (SIB1817.0) is combined at a 1:5 to 1:10 ratio with a traditional coupling agent. It is then processed in the same way as the traditional silane coupling agent.

Effect of dipodal -SiCH₂CH₂Si- on the bond strength of a crosslinkable ethylene-vinyl acetate primer formulation

Primer on metal 10% in <i>i</i> -PrOH	Wet adhesion to metals (N/cm)	
	Titanium	Cold-rolled steel
No silane	Nil	Nil
Methacryloxypropylsilane	0.25	7.0
Methacryloxypropylsilane + 10% dipodal	10.75	28.0 (cohesive failure)

90° peel strength after 2 h in 80°C water.

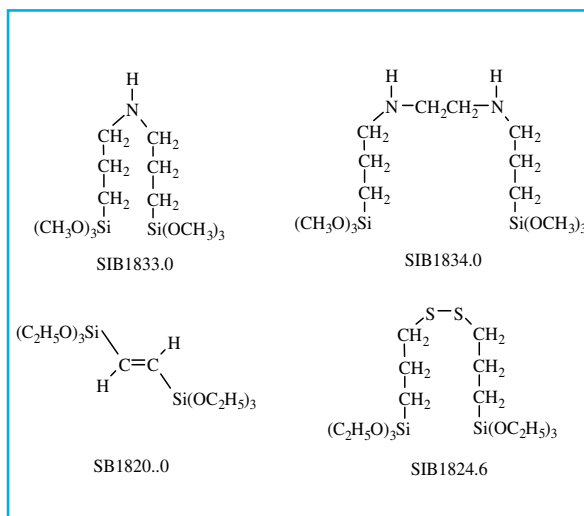
P. Pape et al, in *Silanes and Other Coupling Agents*, ed. K. Mittal, 1992, VSP, p105



Dipodal tetrasulfide silanes are used in “green” tires



Functional Dipodals



Non-Functional Dipodals

