Aminosilanes – Insertion Reactions of Carbon Dioxide and Isocyanates

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Numerous different aminosilanes of the type $R_nSi(NHR')_{4-n}$ with n = 0 - 3 are obtained by reactions of chlorosilanes with amines. They may be used as precursors for silica, Si/C/O or Si/C/N materials.[1,2] Treatment of diaminosilanes with carbon dioxide yields silyl carbamates $R_nSi(OCONHR')_{4-n}$ with n = 1 and 2 quantitatively.[3] Aryl isocyanates Ar-NCO react similarly with aminosilanes to form the corresponding urea derivatives $R_nSi(NArCONHR')_{4-n}$ with n = 1 and 2.[4-6] The obtained insertion products were fully characterized by NMR-spectroscopy (^1H, ^{13}C, ^{29}Si), elemental analysis and in selected cases with single crystal X-ray structure analysis. Thermal treatment of the silyl carbamates $Me_2Si(OCONHR')_2$ at temperatures around 120 – 200 °C gives rise to the formation of oligo- and polydimethylsiloxanes $(Me_2SiO)_n$ and N,N'-disubstituted ureas $OC(NHR')_2$. The latter process can thus be summarized as a novel route to polysiloxanes, with carbon dioxide being the oxygen source.

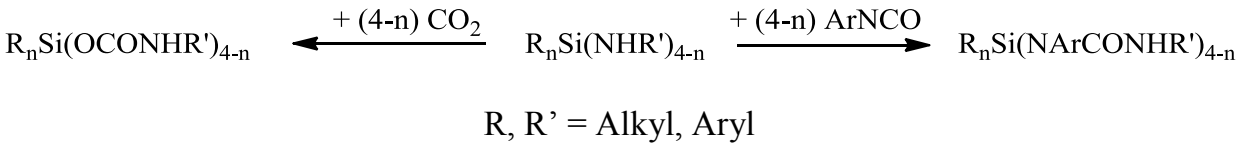

Figure 1. Principal reaction scheme of carbon dioxide and isocyanates with amino(mono)silanes.

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