demand were the primary criteria for the process design. Capital expenditure and energy consumption were considered secondary criteria. While large production quantities of ultra-pure polysilicon were available at acceptable prices for semiconductors, this price was too expensive for the development of low-cost solar systems. For solar cells, a process with reduced costs, reduced energy consumption and increased production rates, with purity levels not as important, is needed. Since several processes had been developed in the past, a review and re-evaluation of the silicon chemistry of these processes was suggeste (see Tables 5.11 and 5.12).

Table 5.11 Historical processes to manufacture polysilicon (according to Strategies Unlimited [79])

Companies	Volatile silicon source	Reduction agent	Reactor type
Dupont	$SiCl_4$	Zinc	Inside-quartz tube
Bell lab.	$SiCl_4$	Hydrogen	Ta-filament
Union Carbide	$SiHCl_3$	Hydrogen	Inside-quartz tube
Int'l Telephone	$SiCl_4$	Sodium hydride NaH	Ta-filament
Mallinckrodt	SiI_4	Hydrogen	Inside-quartz tube
Transitron	SiH_4	Decomposition	Inside-quartz tube
Texas Instruments	$SiCl_4$	Hydrogen	Outside-quartz tube
Foot Mineral	SiI_4	Decomposition	Si-filament
Chisso	$SiCl_4$	Hydrogen	Inside-quartz tube
Siemens	$SiHCl_3$	Hydrogen	Si-filament
Komatsu	SiH_4SiHCl_3	Decomposition	Si-filament
Motorola	$SiHCl_3$	Hydrogen	W-filament
Phoenix Materials	$SiCl_4$	Hydrogen	Si-filament
Texas Instruments	$SiHCl_3$	Hydrogen	Fluidised bed spheres

Table 5.12 Polysilicon research projects stimulated by the objectives of low-cost solar cells programs after 1975

Companies/groups	Volatile silicon source	Reduction agent	Reactor type
Aerochem Res. Lab.	$SiCl_4$	Sodium	Free space
Eagle Picher/General Atomic/Allied	SiH_4	Decomposition	Fluidised bed
Battelle	$SiCl_4$	Zink	Fluidised bed
Hemlock	SiH_2Cl_2	Hydrogen	Si-filament/rod
Union Carbide	SiH_4	Decomposition	Free space
Union Carbide	SiH_4	Decomposition	Fluidised bed
Ethyl Corp	SiH_4	Decomposition	Fluidised bed
Motorola	Si_nF_{2n+2}	Decomposition	
NEDO	$SiHCl_3$	Hydrogen	Fluidised bed
Rhône–Poulenc	SiH_4	Decomposition	
Schumacher	$SiHBr_3$	Hydrogen	Fluidised bed
SRI International	SiF_4	Sodium	Solid separation
Westinghouse	$SiCl_4$	Sodium	Free space
Bayer	$SiCl_4$	Aluminium	Melt
Bayer	SiH_4	Decomposition	Fluidised bed
Wacker	$SiHCl_3$	Hydrogen	Fluidised bed