

Abstract

The present invention relates to an improved process and apparatus for the preparation of trichlorosilane and polycrystalline silicon. During the preparation of polycrystalline silicon, trichlorosilane is prepared by hydrochlorination, comprising a) heating metallurgical silicon to a temperature of 300-500 °C in a powder drying furnace followed by putting it into a reactor; b) gasifying and heating silicon tetrachloride with an external heater to form silicon tetrachloride gas of a temperature of 160-600 °C; c) preheating hydrogen chloride gas to a temperature of 150-300 °C with the external heater; d) preheating hydrogen gas to a temperature of 300-600 °C with a heater; and e) introducing gases from steps b), c) and d) into the reactor with a hydrogen to silicon tetrachloride molar ratio of about 1: 1 to 5: 1 and a hydrogen chloride to silicon tetrachloride molar ratio of about 1: 1 to 1: 20, the reactor being kept at a temperature of about 400-600 °C and under a pressure of about 1.0-3.0 MPa. The process of the present invention can cost-effectively prepare polycrystalline silicon suitable for use in semiconductor industry and solar cells.