the solid substrate with the deposited metal- or semimetal-containing compound is brought in contact with an acid in the gaseous phase. Without being bound by a theory, it is believed that the protonation of the ligands of the metal- or semimetal-containing compound facilitates its decomposition and reduction. Suitable acids include hydrochloric acid and carboxylic acids, preferably, carboxylic acids such as formic acid, acetic acid, propionic acid, butyric acid, or trifluoroacetic acid, in particular formic acid.

Alternatively, it is possible to deposit aluminum from the compound of general formula (I), (II), (III), (IV), (V), (VI), or (VII). In this case, the compound of general formula (I), (II), (III), (IV), (V), (VI), or (VII) adsorbs to the surface of the solid substrate, for example because there are reactive groups such as OH groups on the surface of the solid substrate or the temperature of the solid substrate is sufficiently high. Preferably the adsorbed compound of general formula (I), (II), (III), (IV), (V), (VI), or (VII) is decomposed.

The decomposition can be effected in various ways. The temperature of the solid substrate can be increased above the decomposition temperature. In this case, the process is a chemical vapor deposition (CVD) process. Typically, the solid substrate is heated to a temperature in the range of 300 to 1000 °C, preferably in the range of 350 to 600 °C.

Furthermore, it is possible to expose the deposited compound of general formula (I), (II), (III), (IV), (V), (VI), or (VII) to a plasma like an oxygen plasma, hydrogen plasma, ammonia plasma, or nitrogen plasma; to oxidants like oxygen, oxygen radicals, ozone, nitrous oxide (N_2O), nitric oxide (NO), nitrogen dioxde (NO_2) or hydrogen peroxide; to ammonia or ammonia derivatives for example tert-butylamine, iso-propylamine, dimethylamine, methylethylamine, or diethylamine; to hydrazine or hydrazine derivatives like N,N-dimethylhydrazine; to solvents like water, alkanes, or tetrachlorocarbon; or to boron compound like borane. The choice depends on the chemical structure of the desired layer. For aluminum oxide, it is preferable to use oxidants, plasma or water, in particular oxygen, water, oxygen plasma or ozone. For aluminum, nitride, ammonia, hydrazine, hydrazine derivatives, nitrogen plasma or ammonia plasma are preferred. For aluminum boride boron compounds are preferred. For aluminum carbide, alkanes or tetrachlorocarbon are preferred. For aluminum carbide nitride, mixtures including alkanes, tetrachlorocarbon, ammonia and/or hydrazine are preferred.

The process is preferably performed as atomic layer deposition (ALD) process comprising the sequence

(c) bringing a solid substrate in contact with a compound of general formula (I), (II), (III), (IV), (V), (VI), or (VII) and

(d) decomposing the adsorbed compound of general formula (I), (II), (III), (IV), (V), (VI), or (VII).

Preferably, the sequence comprising (c) and (d) is performed at least twice, more preferably at least five times, even more preferably at least 10 times, in particular at least 50 times. Often, the sequence comprising (c) and (d) is performed not more than 1000 times.