# Process for the Generation of Thin Inorganic Films

## Description

The present invention is in the field of processes for the generation of thin inorganic films on substrates, in particular atomic layer deposition processes.

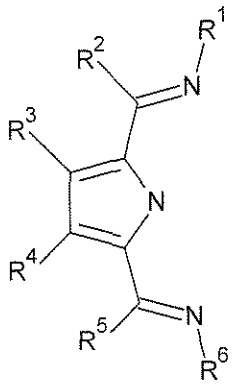
With the ongoing miniaturization, e.g. in the semiconductor industry, the need for thin inorganic films on substrates increases while the requirements of the quality of such films become stricter. Thin inorganic films serve different purposes such as barrier layers, seeds, liners, dielectrica, or separation of fine structures. Several methods for the generation of thin inorganic films are known. One of them is the deposition of film forming compounds from the gaseous state on a substrate. In order to bring metal or semimetal atoms into the gaseous state at moderate temperatures, it is necessary to provide volatile precursors, e.g. by complexation the metals or semimetals with suitable ligands. These ligands need to be removed after deposition of the complexed metals or semimetals onto the substrate.

*WO 2012 / 057 884 A1 discloses nitrogen-containing ligands for transition metals and their use* in atomic layer deposition methods.

JP 2001 261 638 A discloses metal complex compounds which have a diimino pyrrolyl ligand useful as catalyst for an alpha olefin polymerization.

An object of the ~~present invention~~embodiments disclosed herein was to provide a process for the generation of thin inorganic films on solid substrates by depositing metals or semimetals from the gaseous or aerosol state. It was desired that this process can be performed with as little decomposition of the precursor comprising the metal or semimetal as possible while the precursor is brought into the gaseous or aerosol state. At the same time it was desired to provide a process in which the precursor is easily decomposed after deposited on a solid substrate. A further object was to provide a process which is applicable for a broad variety of different metals or semimetals. It was also aimed at providing a process to generate high quality films under economically feasible conditions.

~~These objects were achieved by~~In an aspect, there is provided a process comprising bringing a compound of general formula (I) into the gaseous or aerosol state

$L_n$----M---$X_m$ (I) L= 

and depositing the compound of general formula (I) from the gaseous or aerosol state onto a solid substrate, wherein

$R^1$, $R^2$, $R^3$, $R^4$, $R^5$, and $R^6$ are independent of each other hydrogen, an alkyl group, or a trialkylsilyl group,
n is an integer from 1 to 3,
M is a metal or semimetal,
X is a ligand which coordinates M, and
m is an integer from 0 to 4.

~~The present invention also relates to~~In another aspect, there is provided a compound of general formula (I), wherein

$R^1$, $R^2$, $R^3$, $R^4$, $R^5$, and $R^6$ are independent of each other hydrogen, an alkyl group, or a trialkylsilyl group,
n is an integer from 1 to 3,
M is Sr, Ba, Co, or Ni,
X is a ligand which coordinates M, and
m is an integer from 0 to 4.

~~The present invention also relates to~~In another aspect, there is provided the use of a compound of general formula (I), wherein

$R^1$, $R^2$, $R^3$, $R^4$, $R^5$, and $R^6$ are independent of each other hydrogen, an alkyl, or a trialkylsilyl group,
n is an integer from 1 to 3,
M is a metal or semimetal
X is a ligand which coordinates M, and
m is an integer from 0 to 4

for a film formation process on a solid substrate.

Preferred embodiments of the present disclosure~~invention~~ can be found in the description and the claims. Combinations of different embodiments fall within the scope of the present ~~invention~~disclosure.