

## Characterization of Titanium Nitride Reaction Products Formed at Various Temperatures in Chemical Deposition Processes

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The reaction products of TiN deposition processes formed below 200°C is characterized in this work. TiN reaction product in high temperature above 500°C is relatively well characterized but the product in the temperature range below 200°C is not well known. By understanding the reaction mechanism below 200°C we can control and reduce the unwanted TiN particle formed in the exhaust line and pumping system, which lead to the improvement of productivity in TiN chemical vapor deposition processes.

The reaction is observed at various parts of chemical vapor deposition chamber including chamber, line, and TiN particle trap. The reactive feed gases are TiCl<sub>4</sub> and NH<sub>3</sub> and the products are composed of Ti, N, Cl, and H. The composition of reaction product below 200°C is analyzed by energy dispersion spectrometer (EDS). The reaction product, TiN<sub>x</sub>Cl<sub>y</sub>, is also heated to higher temperatures above 530°C to observe the composition change dependence on temperature. The atomic composition of the reaction products were Ti:N:Cl = 1: 11.7: 13.0 at 25°C, TiN<sub>x</sub>Cl<sub>y</sub> at 530°C. On heating the reaction product, TiN<sub>x</sub>Cl<sub>y</sub>, the stoichiometric ratio of Ti and N becomes close to 1:1.