SUMMARY

[0007] According to one aspect, a method of forming a metal-containing film by atomic layer deposition is provided. The method comprises delivering a metal-containing complex, a purge gas, and a co-reactant to a first substrate under conditions sufficient for the metal-containing complex to: (i) deposit metal and etch the metal-containing film; (ii) deposit metal, etch the metal-containing film and allow for desorption from the metal-containing film; or (iii) deposit metal and allow for desorption from the metal-containing film; such that the metal-containing film selectively grows on at least a portion of the first substrate.

[0007a] In yet another aspect, there is provided a method of forming a metal-containing film by atomic layer deposition, wherein the method comprises delivering a metal-containing complex, a purge gas, and a co-reactant to a first substrate under conditions sufficient for the metal-containing complex to (i) deposit metal and etch the metal-containing film; (ii) deposit metal, etch the metal-containing film and allow for desorption from the metal-containing film; or (iii) deposit metal and allow for desorption from the metal-containing film; such that the metal-containing film selectively grows on at least a portion of the first substrate; and wherein the conditions comprise a super-conformal growth cycle sufficient for the metal-containing film to selectively grow on a lower portion of a feature in the first substrate

[0008] Other embodiments, including particular aspects of the embodiments summarized above, will be evident from the detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Fig. 1a illustrates a feature having a non-uniform width (also known as a "re-entrant feature").

[00010] Fig. 1b illustrates a feature having substantially uniform width.

[00011] Figs. 2a and 2b illustrate an example of super-conformal growth.

[00012] Fig. 2c illustrates an example of bottom-up-fill.

[00013] Fig. 2d illustrates an example of conformal growth.

[00014] Fig. 3 provides a scanning electron microscopy (SEM) image of a top portion of feature A1, at 150 K magnification, tilted view, showing a thick molybdenum film was deposited both at an upper portion of feature A1 and outside the feature A1.

[00015] Fig. 4 provides an SEM image of a bottom portion of feature A2, at 150 K magnification, perpendicular view, showing that a thick molybdenum film was deposited at a lower portion of feature A2.