

ABSTRACT OF THE DISCLOSURE

PVD-IMP TUNGSTEN AND TUNGSTEN NITRIDE AS A LINER, BARRIER, AND/OR SEED LAYER FOR TUNGSTEN, ALUMINIUM AND COPPER APPLICATIONS

The present invention provides a method of depositing a tungsten-based liner/barrier layer on a substrate, preferably using a high-density plasma PVD process, such as an ionized metal plasma (IMP) process or other processes with ionize a sputtered flux of material from a target. If a Ti and/or TiN liner/barrier layer is deposited, the present invention provides a method of reducing or eliminating the reactions between WF_6 and the Ti, TiN, and Si materials by depositing tungsten by PVD-IMP processing thereover. Tungsten may also be deposited in the presence of a nitrogen source to produce a tungsten nitride liner/barrier layer. The tungsten liner/barrier layer may be followed by another tungsten layer deposited by a CVD process. The tungsten and other materials can also be deposited by other processes such as electroplating processes and other types of PVD including non-ionized sputtering, collimated sputtering, and long throw sputtering.

Fig. 1

This Sheet Has Been Replaced

