

ABSTRACT OF THE DISCLOSURE

The present invention generally provides a method and an apparatus for forming a doped metal film on a conductive substrate. In one aspect of the invention, the deposition process comprises first depositing a phosphorous doped seed layer on a conductive substrate, and then depositing a conductive metal layer on the phosphorous doped seed layer to form a conductive film. In another aspect, the invention provides a method of processing a substrate including depositing a dielectric layer on a substrate, etching a feature into the substrate, depositing a conductive layer in the feature, depositing a phosphorous doped seed layer on the conductive barrier layer, and depositing a conductive metal layer on the phosphorous doped seed layer. In another aspect of the invention, an apparatus is provided that includes a phosphorous doped anode used for depositing a phosphorous doped metal film, such as a seed layer, in an electrochemical deposition process. The phosphorous doped anode preferably includes an enclosure providing for flow of an electrolyte therethrough, a phosphorous doped metal disposed within the enclosure, and an electrode disposed through the enclosure and in electrical connection with the phosphorous doped metal. Another aspect of the invention provides an apparatus for electrochemical deposition of a phosphorous doped metal onto a substrate includes a substrate holder adapted to hold the substrate in a position where the substrate plating surface is exposed to an electrolyte in an electrolyte container, a cathode electrically contacting the substrate plating surface, an electrolyte container having an electrolyte inlet, an electrolyte outlet and an opening adapted to receive the substrate plating surface, and a phosphorous doped anode electrically connected to the electrolyte.

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