

NANOELECTRONIC AND MICROELECTRONIC CLEANING COMPOSITIONS

Abstract

5 Nanoelectronic and microelectronic cleaning compositions for cleaning
nanoelectronic and microelectronic substrates under supercritical fluid state
conditions, and particularly cleaning compositions useful with and having
improved compatibility with nanoelectronic and microelectronic substrates
characterized by silicon dioxide, sensitive low-k or high-k dielectrics and copper,
10 tungsten, tantalum, nickel, gold, cobalt, palladium, platinum, chromium,
ruthenium, rhodium, iridium, hafnium, titanium, molybdenum, tin and other
metallization, as well as substrates of Al or Al(Cu) metallizations and advanced
interconnect technologies, are provided by nanoelectronic and microelectronic
cleaning compositions comprising nanoelectronic and microelectronic cleaning
15 compositions of this invention are provided by compositions comprising: (1) a
supercritical main fluid reaching a supercritical fluid state at a temperature of
250°C or less and a pressure of 600 bars or less (592.2 atm, 8702.3 psi), and (2)
as a secondary fluid, a modifier formulation selected from the following
formulations: a) a formulation comprising: an oxidizing agent; a polar organic
20 solvent selected from the group consisting of amides, sulfones, sulfolenes,
selenones and saturated alcohols; and optionally other components; b) a silicate
free formulation comprising: a polar organic solvent selected from the group
consisting of amides, sulfones, selenones and saturated alcohols; a strong
alkaline base; and optionally other components; c) a formulation comprising: from
25 about 0.05% to 30% by weight of one or more non-ammonium producing strong
base containing non-nucleophilic, positively charged counter ions; from about 0.5
to about 99.95% by weight of one or more corrosion inhibiting solvent
compounds, said corrosion inhibiting solvent compound having at least two sites
capable of complexing with metals; and optionally other components; d) a
30 formulation comprising: from about 0.05 to 20% by weight of one or more non-

- ammonium producing, non-HF producing fluoride salt; from about 5 to about 99.95% by weight of water, organic solvent or both water and organic solvent; and optionally other components; and e) a formulation comprising: from about
- 5 0.05% to 30% by weight of one or more non-ammonium producing strong base containing non-nucleophilic, positively charged counter ions; from about 5 to about 99.95% by weight of one or more steric hindered amide solvents; and optionally other components.