means perfluorohexylethylphosphonic acid. "$C_6H_{13}P(O)(OH)_2$" means hexylphosphonic acid. "$C_4H_9P(O)(OH)_2$" means butylphosphonic acid. "$C_6H_5P(O)(OH)_2$" means phenylphosphonic acid. Furthermore, "$C_{14}H_{29}NH_2$" means tetradecylamine. "$C_{12}H_{25}NH_2$" means dodecylamine. "C_6F_{13}–C_2H_4–NH_2" means perfluorohexylethylamine. "$C_8H_{17}NH_2$" means octylamine. "$C_{12}H_{25}SH$" means dodecanethiol. "$C_8H_{17}COOH$" means nonanoic acid. Additionally, "DGEEA" means diethylene glycol monoethyl ether acetate. "DGEEA/iPA" means a solvent obtained by combining DGEEA and iPA at a mass ratio of 95:5. "DGEEA/water" means a solvent obtained by combining DGEEA and water at a mass ratio of 95:5. "Water/PGME" means a solvent obtained by combining water and propylene glycol monomethyl ether at a mass ratio of 70:30. "Water/iPA" means a solvent obtained by combining water and iPA at a mass ratio of 70:30.

[0181] [Example II-51]

(ii-1) Preparation of Liquid Chemical for forming Protecting Film

A mixture of: 0.002 g of octadecylphosphonic acid [$C_{18}H_{37}P(O)(OH)_2$] that serves as a water repellent protecting film forming agent; and 99.998 g of PGMEA that serves as a solvent was stirred for 18 hours thereby obtaining a liquid chemical for forming a protecting film, the liquid chemical having a protecting film forming agent concentration of 0.002 mass%.

[0182] (ii-2) Cleaning of Wafer having Tungsten Film

As a pretreatment step 2, a wafer having a smooth tungsten film (a silicon wafer formed having on its surface a tungsten layer of 50 nm thickness) was immersed in 1 mass% aqueous ammonia for 1 minute, and then immersed in pure water for 1 minute. Furthermore, as a pretreatment step 3, the wafer was immersed in iPA for 1 minute.

[0183] (ii-3) Surface Treatment of Surface of Wafer having Tungsten Film, using Liquid Chemical for forming Protecting Film

As a protecting film forming step, the wafer having the tungsten film was immersed in the liquid chemical for forming a protecting film at 20 °C for 10 minutes, the liquid chemical having been prepared in the above "(ii-1)