Ultrathin, Ultrasmooth Gold Layer on Dielectrics without the Use of Additional Metallic Adhesion Layers

With advances in the plasmonics and metamaterials research field, it has become more and more important to fabricate thin and smooth Au metal films in a reliable way. Here, by thin films we mean that their average height is below 10 μm and their average roughness is below 5% of the total thickness. In this article, we investigated the use of amino- and mercapto-silanes to increase the adhesion of Au on Si wafers, thus obtaining a smooth and thin layer. This method does not include the use of other metals to improve the adhesion of gold, like Ti or Cr, since they would reduce the optical characteristics of the structure. Our results show that layers having 6 nm thickness and below 0.3 nm roughness can be reproducibly obtained using aminosilanes. Layers having a nominal thickness of 5 nm have a yield of 58%; thus, this thickness is the limit for the process that we investigated.