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Tightly adhering diamond-like carbon films on copper substrates by oxygen pre-implantation

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Copper is one of the substrates that are difficult to coat with a diamond-like carbon film because of the latter's poor adhesion. Two factors that can improve the adhesion in this case are the surface roughness and the oxidation of the surface. The dependence of the adhesive strength of the diamond-like carbon film on both factors was measured for samples that were prepared by a plasma process using a pulsed voltage. The main parameter was the ion energy of the oxygen ions. For pulse voltages higher than −16 kV a drastically increased adhesion was found, correlated to a rough surface and the presence of Cu_2O in the interface. The adhesive strength of the film surpasses the maximum amount that can be measured with a pull test. The same good adhesion can be realized at lower voltages by changing the plasma gas to a mixture of oxygen and argon. The additional argon changes the surface topography of a polycrystalline copper substrate.

Keywords: diamond-like carbon, oxidation, implantation, copper, adhesion

1. Introduction

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