

## On the Composite Electroless Plating of Diamond

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Small diamond particles agglomerate in the process of composite electroless plating. And they possess a great ability of sorption and catalysis, resulting in the decomposition of the electroless bath easily. So, diamond needs appropriate pretreatment to eliminate the impurity and improve its hydrophilicity before plating. Mild steel specimens (0.20% C) used were degreased after polishing, then dipped into a diluted acid solution to remove the rust. Two kinds of electroless baths were used, both of which are acidic solution and sodium hypophosphite were employed as the reducing agent. By means of an orthogonal experimental design, the effect of the kind of electroless bath, the kind and the content of the surfactant, the kind and the concentration of the diamond and the annealing temperature on the hardness, friction coefficient and wearability of the coating was studied.

The following conclusions can be drawn from the experimental results and analysis:

(1)The rank of factors affecting the friction coefficient of coating from big to small is: the kind of diamond, the kind of the surfactant, the annealing temperature and the content of the surfactant. And the effect of the kind of electroless bath and the concentration of diamond are very limited. Moreover, the optimal result is obtained when the particle is grey nanodiamond, cetyltrimethyl ammonium chloride as the surfactant, an annealing temperature of 350°C, and a surfactant content of 1:15(the ratio to diamond) .

(2)The rank of factors affecting the wearability of coating from big to small is: the kind of the surfactant, the content of the surfactant, the content of the diamond and the kind of diamond. The effect of the kind of electroless bath and the annealing temperature can be ingored. Moreover, the optimal conditions are: sodium hexametaphosphate as the surfactant, a surfactant content of 1:15, micro-scale diamond, and a diamond concentration of 10g/L.

(3)The composite electroless coatings of diamond are assuredly of a great wearability. But some coatings cause a severe adhesive wear of the counter-pair, and a higher hardness does not always accord with a good wearability.