Deep oxidation of aluminum by a DC oxygen plasma

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Abstract

A novel way of oxidising aluminum using a DC oxygen plasma is described. The oxidation is carried out with a pressure of ~0.1 bar, an electrical current lower than 3 mA, and a working distance between the electrodes of the order of 1 cm. The pressure is seen to have a stronger influence on the results than the working distance. The process does not damage the surface and only minor differences are detected in the topography due to the expansion of the aluminum during oxidation. It is shown that the region affected by the plasma results in a ~50-nm-thick amorphous aluminum oxide layer (OL). We find that the kinetics of oxide growth can be described as having two main sources, the main one originating from the plasma and the other from the surrounding ionized gas.