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Metallic Coating of Thermally Unstable Substrates, Especially Wooden Surfaces, by use of a non-thermal Atmospheric Pressure Plasma Jet

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We present the preparation of wooden surfaces with metallic coatings that have been applied by a non-thermal atmospheric pressure Plasma Jet. The example of copper as a layer material has been chosen to introduce the possibilities of the combination of thermally unstable substrates such as paper, wood or different synthetic materials (e.g. PE or PP) with metal. The applied technique can be understood as representative for the combination of different layer/substrate materials also regarding different polymers as layer material.

The copper that was used for this presentation was available in form of particles with a D50 of 10 μ m. To apply the copper-particles on the substrates, a direct discharge Plasma Jet with a high gradient of temperature due to high gas flows, working under atmospheric conditions, was used. The temperature gradient offers the possibility to keep the heating of the substrate surface at a minimum and additionally keeping a small distance between substrate and Plasma Jet. This allows the treatment of relatively small areas with fewer overspray. Furthermore, the velocity of the Plasma Jet can be set, following the requirements of either high process speeds or the creation of dense layers by a single streak.

By the variation of the thickness of the layers from sporadic distributed particles to surface covering layers with up to several 10 μ m, different properties of the substrate-layer-combination are possible.

The field of possible applications reaches from sporadic distributed particles for disinfecting purposes to spray-on circuits or measuring devices. The maximum layer thickness is hereby depending on parameters like average roughness of surface and thermal expansion coefficient of the used substrate materials. The attributes of the layers have been specified through the measurement of conductivity and the adhesion of the layers on the wooden surface.

Keywords

Metal Coatings on Wood

Atmospheric Pressure Plasma Jet

Plasma Coating of Thermally Unstable Materials