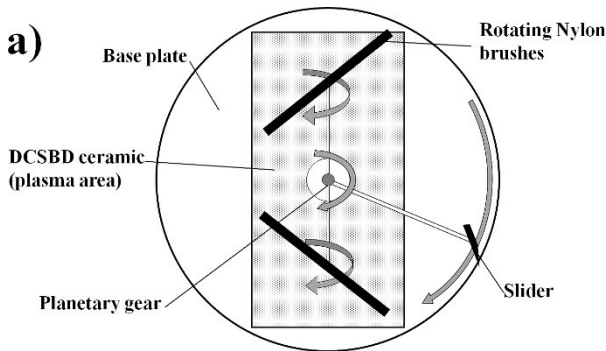


Plasma treatment of powders and improved embedding behaviour into Ni-dispersion coatings

Transfer offer

One area of modern coating technology is the production of electroless nickel dispersion layers, consisting of a nickel-phosphorus matrix with embedded functional particles. To produce such coatings, the particles added to the electrolyte have to be stable and evenly dispersed. For hydrophobic particles such as polymers and some ceramics, dispersants and surfactants are often used, which keep the particles in a stable dispersion. REACH regulates the use of chemicals in electroplating and classifies many surfactants as harmful to people and the environment. Up to now, fluorine-containing surfactants and dispersants have often been used in Ni electrolytes, but their use is subject to strict restrictions and will be partially prohibited in the future. Because of this, an important step would be to dispense without the introduction of dispersants in the electrolyte and to improve the dispersibility of the particles by using alternative surface treatments.

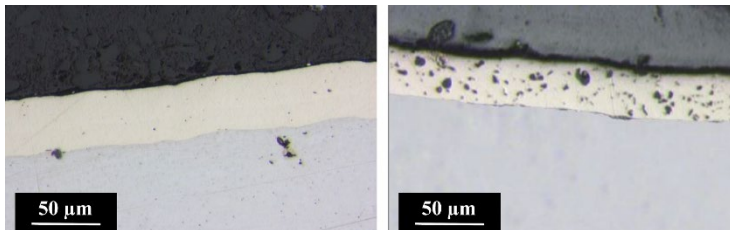


a): Schematic view of the powder treatment reactor, b): photography of the reactor

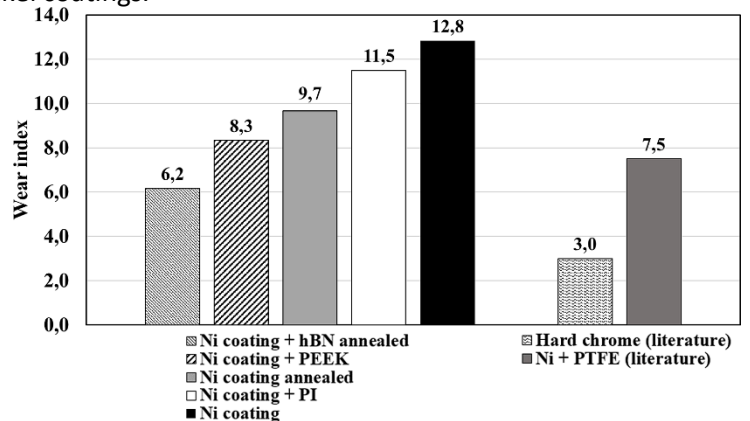
Dispersibility of PEEK-powder in water: plasma-treated powder (left), untreated powder (right)

Technical Solution

By using atmospheric pressure plasma sources, in this work the RPS400 system, in addition with an optimized powder treatment system, hydrophobic powder surfaces can be chemically modified. It is known, that the formation of e.g. oxygen-containing groups leads to an increase in the surface energy and thus to an improved wettability of the surface with polar liquids (e.g. water). By this treatment, the introduction of the powders into aqueous electroless Ni-electrolytes is possible and improves the embedding behaviour in the deposited nickel coatings.



Microscopic examination: Electroless deposited Ni-dispersion coating: addition of untreated PEEK (left) and plasma-treated PEEK (right)



Wear indices of modified electroless Ni-coating in comparison to hardchrome coatings and a Ni-coating containing PTFE-powders (literature references)

Advantages

- universal method for the treatment of powdery substances
- Modification of both polymeric and ceramic materials is possible
- no use of environmentally harmful dispersing agents in the electrolytes
- Improved wear properties of chemically deposited Ni-coatings through the incorporation of plasma-activated powders

Level of development and property rights

- Plasma-treatment of powdery materials is possible, previously examined: polyether ether ketone (PEEK), polyimide (PI), hexagonal boron nitride (hBN)
- Successful embedding of treated powders in chemically nickel layers
- reduced wear of the layers
- own property rights for plasma powder treatment