Vacuum Coating of Porous and/or Elastomeric Substrate Materials

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ABSTRACT

Sidrabe is a Joint-Stock company with ownership both in Latvia and USA. Having well equipped laboratories and expertise, the company is active in innovation channeled to meet foreign markets demand. Together with available production base it enables to supply really tailor-made systems and processes. One of the last unique projects is the equipment and processes for vacuum coating porous and/or elastomeric substrate materials.

DESCRIPTION

J/S Co. Sidrabe is traditionally acting in the development of new materials on the basis of vacuum deposition technologies. Though in recent years the situation on the regional market has been changed essentially, the available labware and qualified personnel influence firm's policy. The company produces a lot of experimental samples for various customers with various demands of foreign markets for new materials and processes.

A group of such demands was connected with vacuum coating of porous and/or elastomeric substrate materials. They comprise foamed polymeric tapes, mesh polymeric sheets, elastomeric woven fabric, elastomeric knit fabric, elastomeric nonwoven fibrous web or laminates of one or more of these materials. Elastomeric polyurethane, polyamide, polyester and other elastomeric polymers are used for these purposes.

The said substrates are mostly coated with aluminum, copper, tin, zinc, nickel and some alloys. In our experiments and commercial systems we used mainly magnetron sputtered copper, titanium and nickel. Thickness of the coating vary from several hundredths of micron up to several microns. Coated materials obtain decorative appearance and/or various other functional properties: conductivity, chemical resistance, optical or thermal reflectivity, chemical resistance, antistatic characteristics. Apart from decorative and packaging applications some of these materials are becoming very important in the battery production, increasing productivity in this industry, decreasing amount of environmentally unfavorable processes.

Of course, the said materials provide some challenge for vacuum coaters. Heat removal from the substrate is a main problem. Though most of these materials are very sensitive to overheating their cooling during vacuum deposition is rather difficult: their pressing to cooling drums or rollers is ineffective, cooling gas supply into the gap between the rollers and substrate may deteriorate adhesion of the coating. Mechanical properties of the substrates hamper control of the material winding during vacuum coating.

The above and other problems were solved successfully during multiple experiments. A corresponding roll-to-roll system has been commercialized in West European market and now it is operating successfully. The system is offered for double-sided coating porous and/or elastomeric substrate materials for various applications. The coated material is 1300 ... 1400 mm wide, its thickness is 1 ... 2 mm. Diameter of the processed roll is up to 1 m. Magnetron sputtering of nickel is made at the speed of the substrate transportation 1 ... 5 m/min. Heat removal is intensified by the supply of cooling gas or liquid into the gap between the substrate and cooling drum. Temperature of the material during deposition does not exceed 120 °C. In case of necessity (less heat resistance of the substrate) lower temperature level may be provided. The system may be easily converted for coating thinner substrates.

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