NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT
IN ELECTRICAL ENGINEERING ICPE-CA

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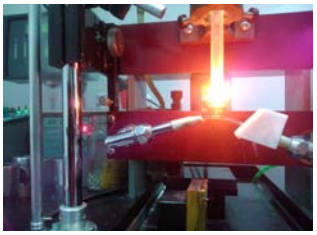
GLASS-COATED MICROWIRES made from COPPER and Fe-Si-B ALLOYS

Description:

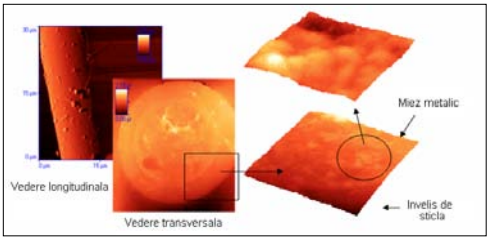
Manufactured by Taylor – Ulitovski technique, the glass-coated microwires can be conductive, resistive, soft magnetic, magnetostrictive, either with giant magnetoresistance or giant magnetoimpedance, as well as with shape memory effect, depending on the nature of the metallic core. INCDIE ICPE-CA can manufacture microwires with conductive or magnetic properties, made from various pure metals or alloys: copper, Fe-Si-B respectively.

Also, on the customer demand INCDIE ICPE-CA can manufacture microwires made from metals like: copper, platinum, cobalt, nickel, gold, silver, or from different alloys of metals, semimetals, semiconductors (silicon, germanium).



Manufacturing glass-coated microwires by Taylor-Ulitovski technique

Spools with glass-coated microwires made from copper and Fe-Si-B alloys



AFM micrographs of the Fe-Si-B glass-coated microwires

Characteristics:

These microwires consist of a cylindrical metallic core, surrounded by a glass insulating layer. The diameter of the metallic core may be from 1 to 50 μm and the thickness of the glass coating from 1 to 20 μm. Depending of the metallic core nature, the microwires length can reach 2 - 3 km. Through the adjusting of the processing parameters, various structures of the metal core can be obtained: polycrystalline, with different sizes of crystals (micro- or nanocrystalline) or amorphous.

Advantages:

The glass coating ensures corrosion protection, as well as possibility to develop magnetic properties due to different behaviour at external stresses (temperature, mechanical stress) of the metallic core and the glass layer. The microwires extremely small sizes (the diameter 2 – 3 times smaller than of the human hair) and their flexibility are very much advantageous for their embedding by different means, in various matrices: polymer, cellulose, textiles. Thus, composite structures with a strong functional character can be obtained, such as composite materials for electromagnetic radiation protection, in the form of flexible shields or fabric, security elements, heating elements for floors etc. Due to their very small specific mass, only small amounts of glass-coated microwires are required to be used for applications.

Applications:

Elements for bias type magnetic encoding, materials for electromagnetic shielding, anti-shoplifting labels, authentication of valuable documents and products, access control, under floor heating systems, conductors - micro cables for telecommunication, sensors and actuators, miniature high-voltage transformers.