

The SPS laboratory

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The Spark Plasma Sintering is a laboratory device designed for new, effective and innovative research, development and production of nano / micro composite ceramic and metal materials prepared from powder sintering method in the presence of plasma - Spark Plasma Sintering. The latest trend is called functionally graded materials (FGM) - layers with different specific properties such as abrasion resistance, chemical resistance, specific insulation, the use of higher operating temperatures and the like.

Main technical data:

SPS, model HP D10-SD (FCT - Systeme GmbH, Germany)

hydraulic press with a force of 10 tons [5 - 100 kN]
max. temperature of 2200 ° C, the heating rate 5-1000 K / min
pulsed DC power source to 5500 A at a voltage of 7.2V
max. continuous power rating of 37 kW
the pulse duration 1 ... 255 ms, the break duration 0 ... 255 ms
process gases - argon, nitrogen (max. 5 bar)
vacuum in cold oven 5×10^{-2} mbar

Characteristics of produced sintered materials:

- the diameters of the samples may be in the range from 10 up to 70 mm,
- thickness of the sample can be up to 5 mm,
- small grain size - nanocomposite materials
- very short sintering times of 1-20 minutes.

Examples of production of sintered materials:

metals: W, Mo, Cr, Ru, Si, Cu

intermetallic materials: TiAl, Ni₃Al, PbTe, SmCo₅

carbides: WC, B₄C, SiC, TiC, ZrC, nitrides: AlN, TiN, Si₃N₄, hBN

MMC / CMC materials for armor: B₄C, SiC, ZrB₂, TiB₂, Al₂O₃ (+ CNT)

transparent materials: spinel, Al₂O₃,

nano-structured materials, functionally graded materials

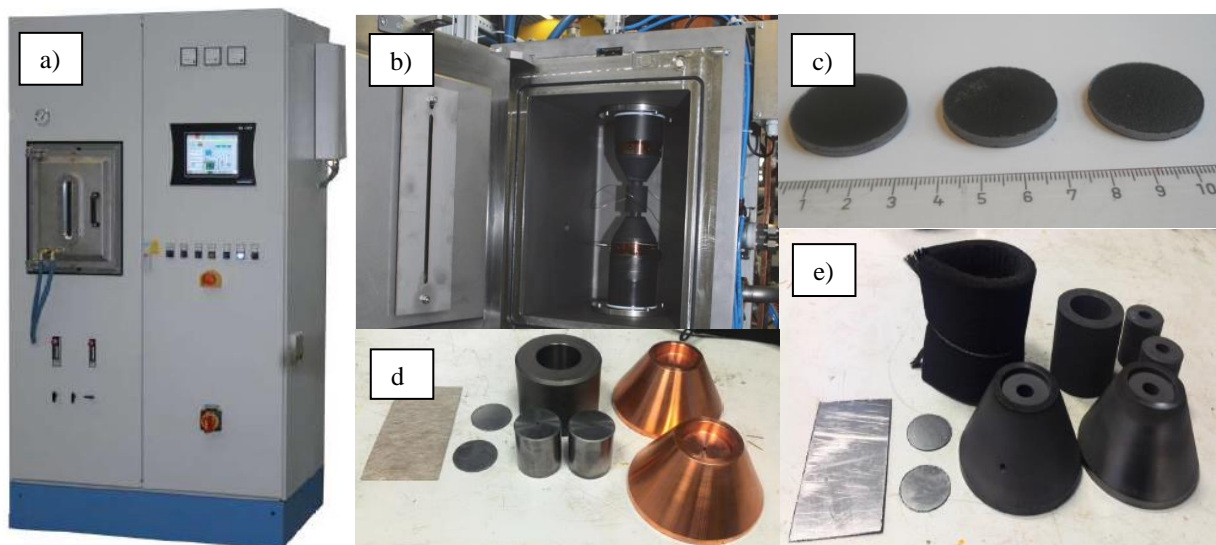


FIG. a) SPS model HP D10-SD, b) view into the sintering chamber, c) shape of the sintered material, d) WC sintering set, e) graphite sintering set