

**National Research Nuclear
University «МЭФТИ»**

Key laboratory for electromagnetic field
assisted processing of novel materials



**Influence of the electric current
on SPS processing**

Ilyina A.M.

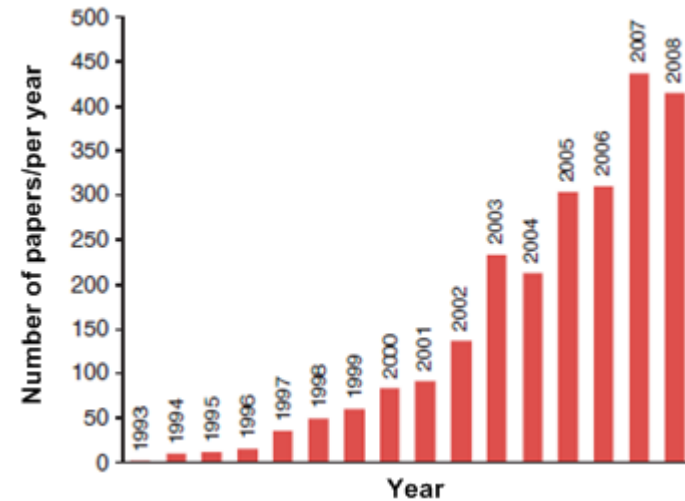
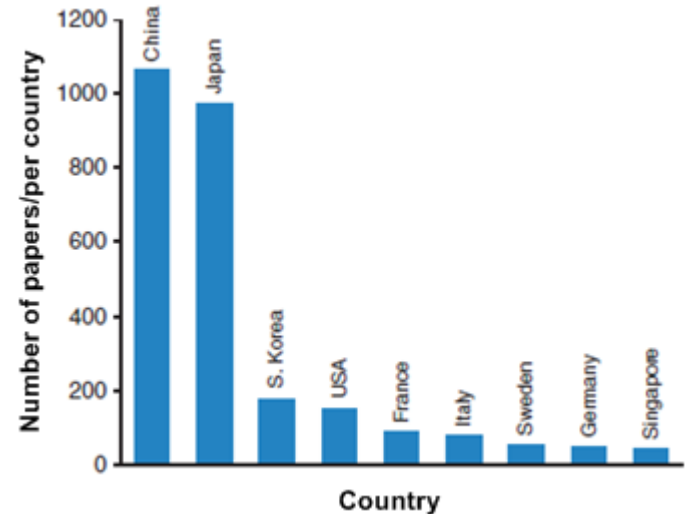
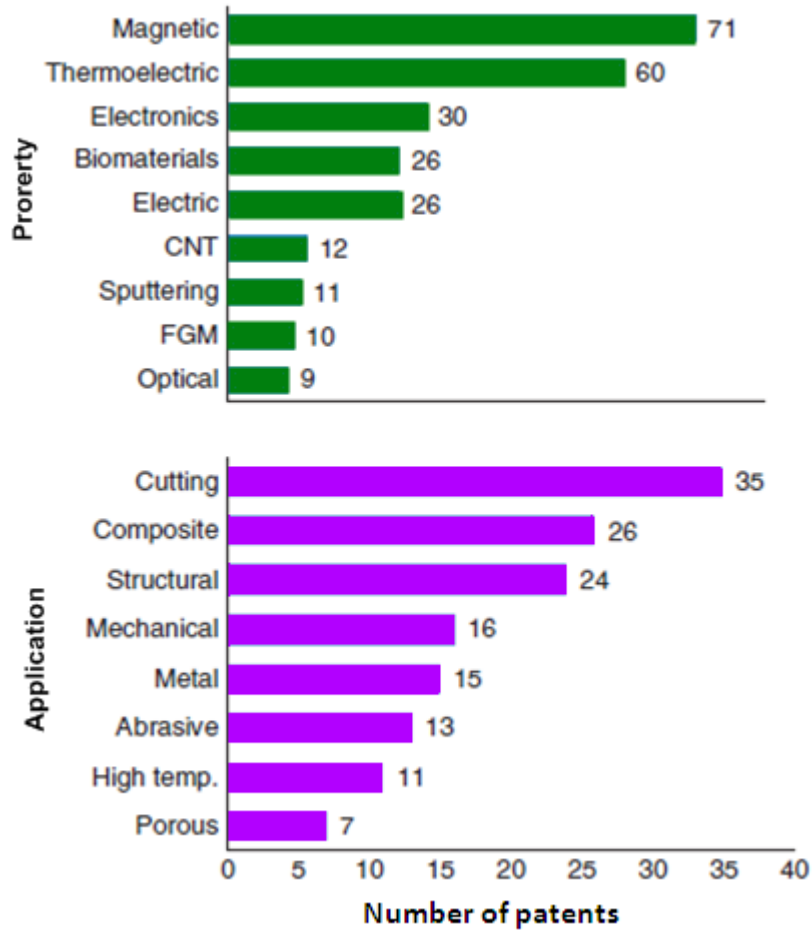
**2nd SCIENTIFIC WORKSHOP
ADVANCED TECHNOLOGIES OF
ELECTROMAGNETIC FIELD
ASSISTED CONSOLIDATION OF
MATERIALS**

Moscow
May 20-23, 2013

Publication Statistics

Since 1899 - Volker patent (GB)

More than 650 patents and 2500 papers

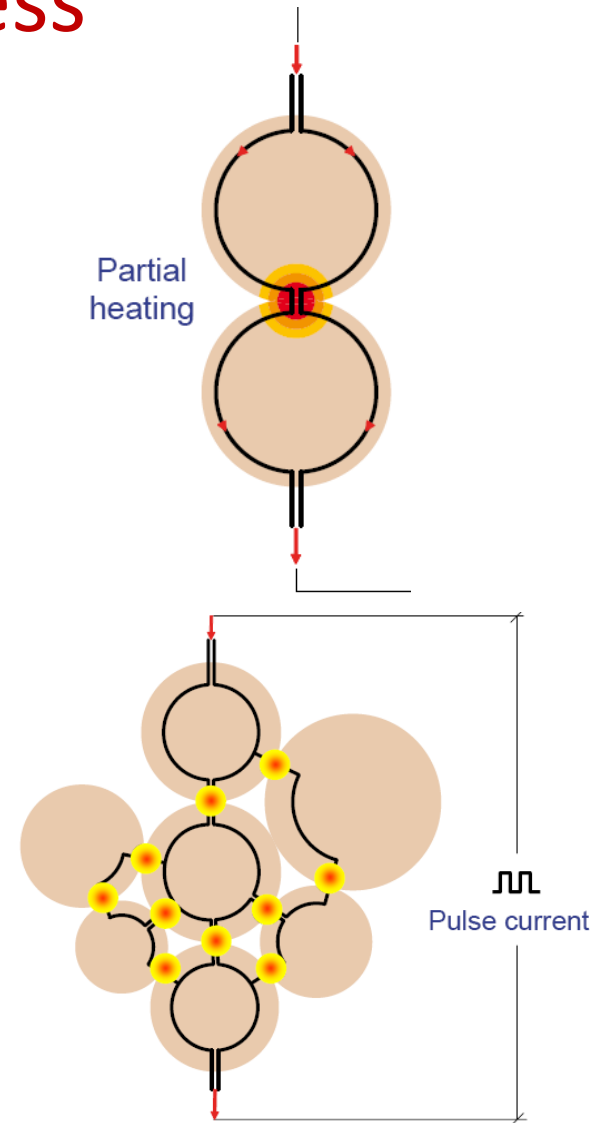


Influence of electric current on SPS process

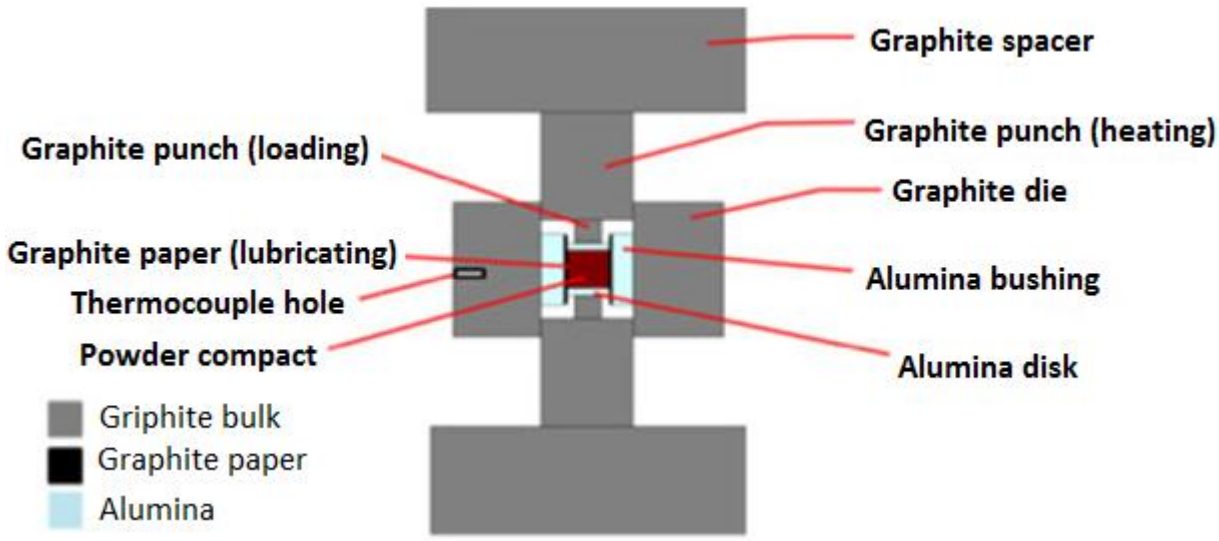
- Mass transport (diffusion rate)
- Destruction of surface oxide
- Retardation of grain growth
- Densification rate

Enhancement of:

- magnetic properties
- thermoelectric properties
- mechanical properties
- corrosion resistance



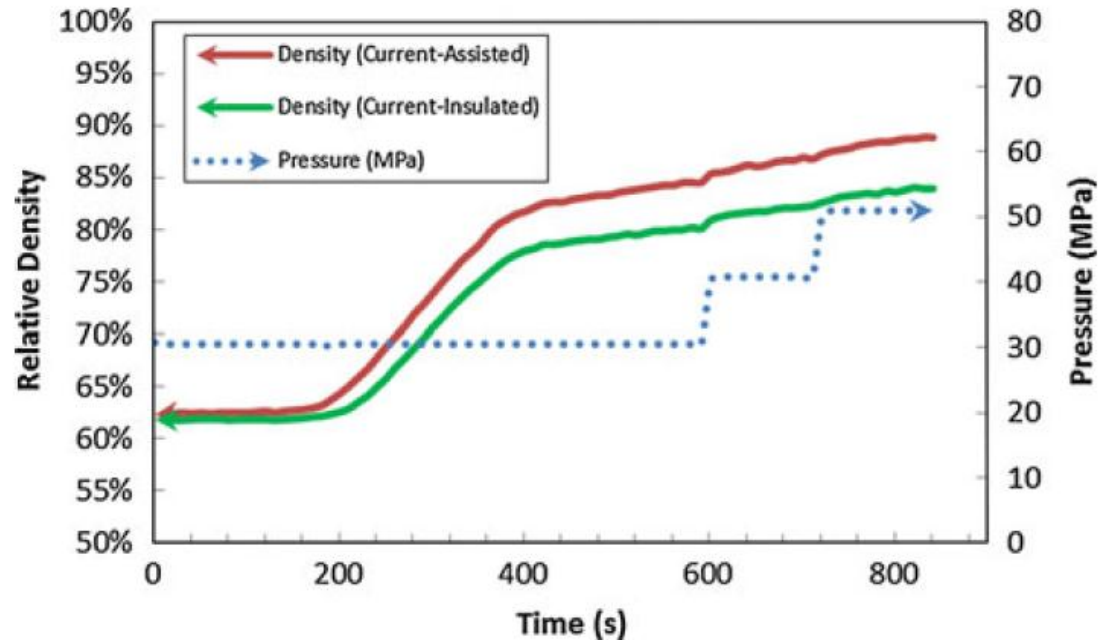
Sintering of Cu powder



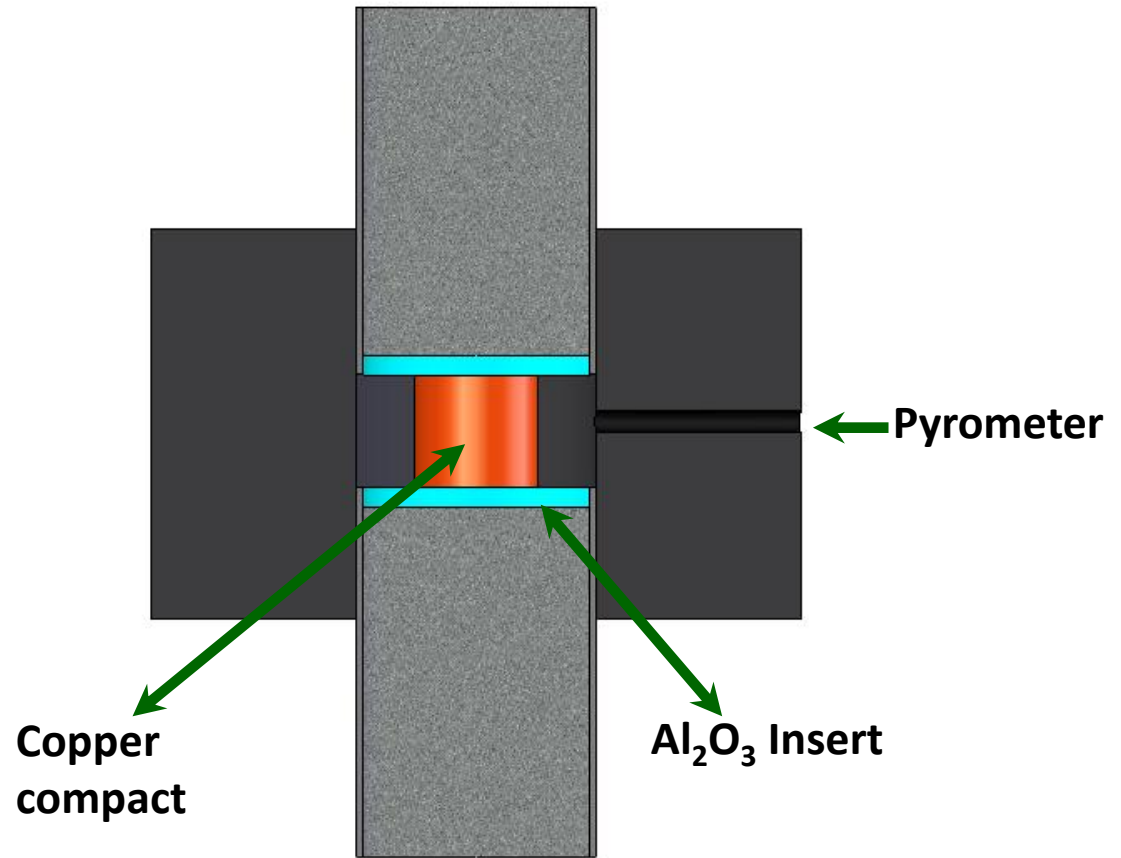
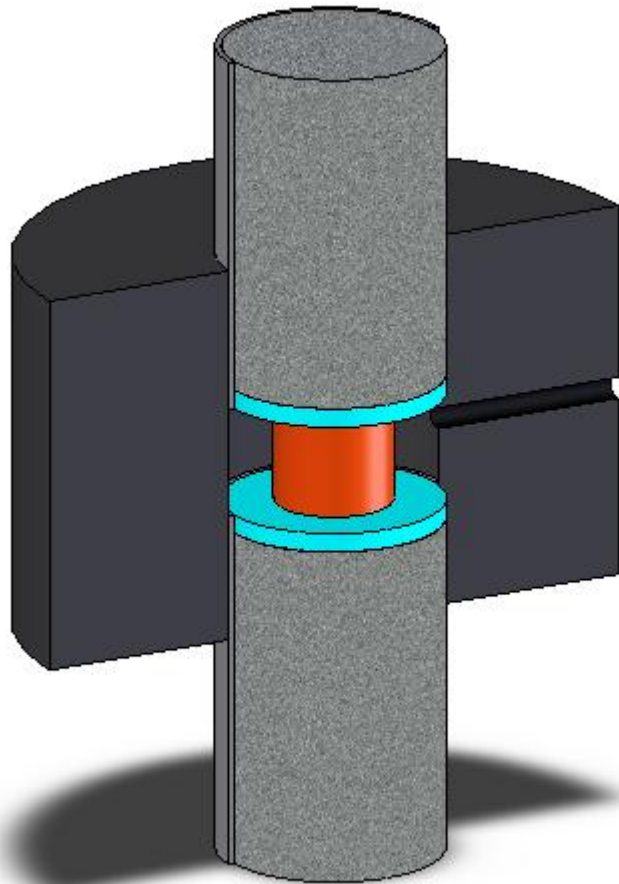
T= 625 °C

P= 30–50 MPa

Relative density Cu
for current-assisted **89%**
for current-insulated **84%**

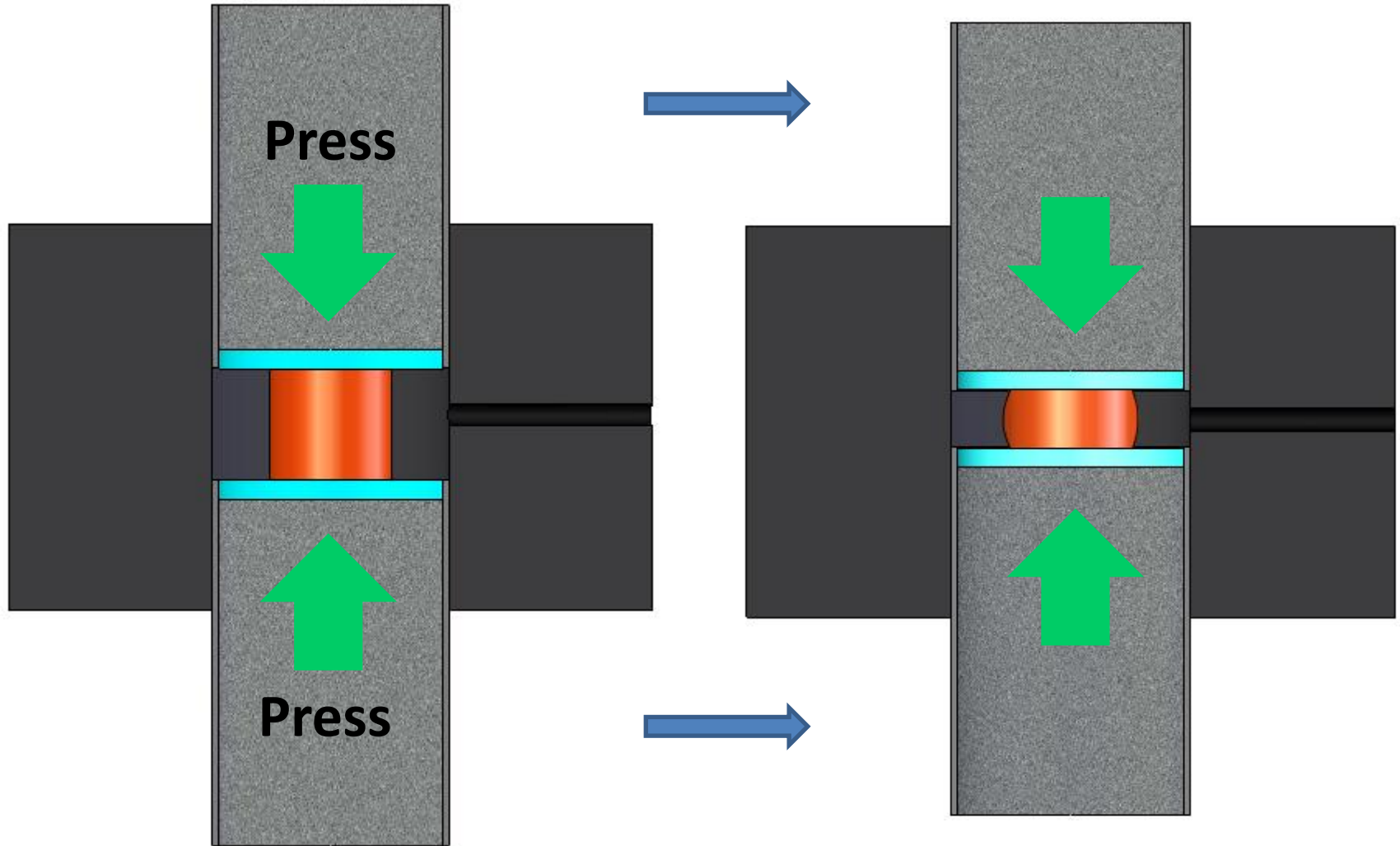


Plan of the experiment

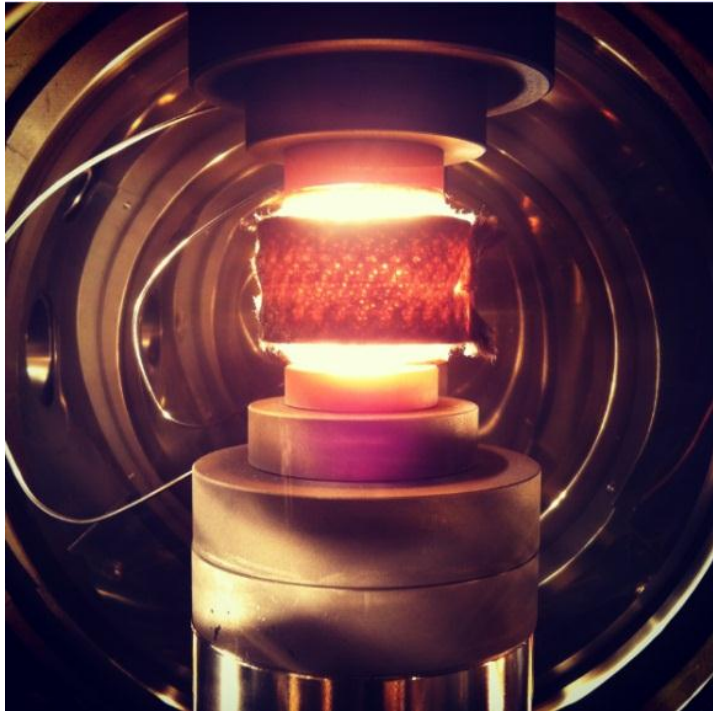


- Specimen diameter < Inner diameter of die
- Using isolating disks only
- Through hole located in the die

Shrinkage process



Outline



- ✓ **1.** Manufacturing of the tools for prepressing the copper powder
- ✓ **2.** Manufacturing of the inserts from aluminum oxide
- 3.** The cold treatment of the copper powder
- 4.** Current-assisted and current-insulated SPS experiments
- 5.** Result analyses
- 6.** Modeling of temperature distribution

Thank you for attention!