

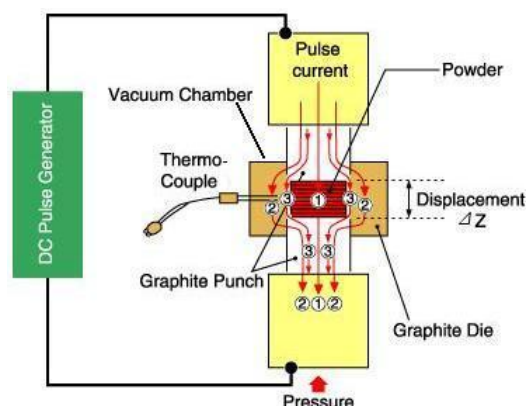
SPS- SPARK PLASMA SINTERING

The Spark Plasma Sintering (SPS) facility is established in 2008 at Department of Materials Science and Engineering with financial contribution from Department of Science and Technology and CARE grants of IIT Kanpur. Being the second unit in the country, this facility is currently installed in the Laboratory for Biomaterials.

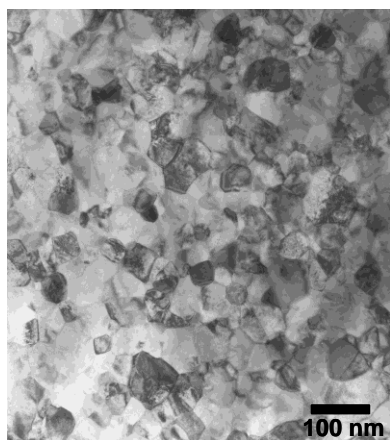
Unique features: SPS is one of the variants of the field activated sintering technique (FAST). FAST involves the simultaneous imposition of an electrical field and pressure, during sintering. A large current (up to 1.5 kA) is made to flow through a porous powder compact, contained in a graphite die-punch assembly. This enables to attain high heating rate of up to 200°C/min, depending on die size. Typically, holding time of 5-10 minutes at sintering temperature is sufficient to densify the materials in SPS process and total processing time is less than one hour. SPS is capable of consolidating difficult-to-densify materials. Superfast consolidation involved in SPS enables the fabrication of materials and components from metals, ceramics, polymers and composites to functionally graded materials (FGM) and thermoelectric semiconductors.



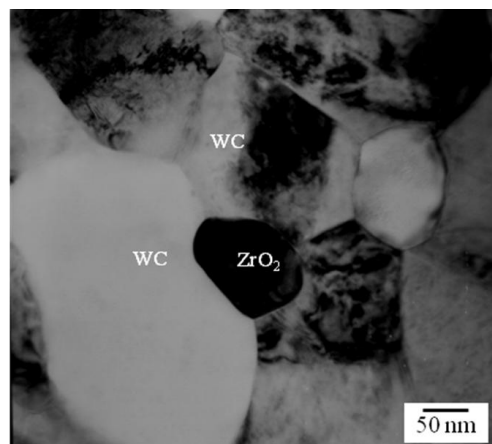
Spark Plasma Sintering facility



Schematic of process description



TEM image of ZrO₂ nanoceramic



TEM image of WC-ZrO₂ nanoceramic composite

In view of faster heating rate and shorter holding time, SPS is capable of producing nanostructured ceramics as well as nanocomposites and importantly, SPS has the potential to restrict sintering reactions in highly reactive systems. This facility is used by a number of research groups from various academic institutions/R&D laboratories, including IIT Kharagpur, Naval Materials Research Laboratory, Vikram Sarabhai Space Center etc..

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