

## Third Laureate Applied Research

26<sup>th</sup> Khwarizmi International Award (KIA)



- **Project Title:** Design and manufacturing of Spark Plasma Sintering (SPS)
- **Executive Organizations:** Malek Ashtar University of technology & IEI electro-optic industries
- **Representative:** Mazaher Ramazani
- **Collaborators:** Mahmood Minootan, Mohammad Reza zadeh, Saadat malekzadeh, Ahmad Ahmadi Bani, Saeid Reza Bakhshi

- **Abstract:**

Spark plasma sintering (SPS) is a high-rate powder consolidation/sintering technology capable of processing metallic, ceramic and composite materials. Theories on the SPS process vary, but most commonly accepted is the micro-spark/plasma concept, which is based on the electrical spark discharge phenomenon wherein a high-energy, low-voltage pulse current momentarily generates spark plasma at high temperatures (many thousands of °C) in fine local areas between particles. SPS' operational or "monitored" temperatures (°2400-200C) are commonly 200 to °500C lower than with conventional sintering, classifying SPS as a lower-temperature sintering technology. Material processing (pressure and temperature rise and hold time) is completed in short periods of approximately 5 to 30 minutes. The relatively low temperatures combined with fast processing times ensure tight control over grain growth and microstructure.

In this project, Materials Engineering Department of Malek Ashtar University in cooperation with SaIran electro-optic industries (Sapa) have designed and built the Spark Plasma Sintering machine. In this research project the technical knowledge required to designing and manufacturing of SPS systems is obtained and a semi-industrial prototype SPS machine was built.

