

Development and optimization of the Powder Extrusion Moulding (PEM) process for the production of metallic or ceramic profiles

Summary/Characteristics

The Materials Synthesis and Processing Group (SIPMAT) at Universidad Carlos III de Madrid has extensive experience in Powder Extrusion Moulding (PEM) technology. This technique enables the production of continuous metallic or ceramic profiles—both hollow and solid—with high precision. SIPMAT has adapted this technology for the fabrication of ceramic or metallic microtubes and microlaminates for highly demanding applications such as Solid Oxide Fuel Cells (SOFCs).

Collaboration is sought with companies manufacturing metal, ceramic, or plastic components in various industrial sectors (automotive, aerospace, electronics, energy, etc.) that aim to integrate this production technology or seek the development of a specific product using it.

Innovative Aspects

- Enables the fabrication of high dimensional precision metallic or ceramic profiles from fine powders and customized binder systems.
- Uses lower processing temperatures than conventional methods.



Schematic representation of the powder extrusion moulding (PEM) process

- Allows the production of profiles with variable porosity along the part.
- On-demand control of porosity, adapting the microstructure to different final applications.
- Integrated approach that enables parameter adjustment at each stage to obtain the desired mechanical and structural properties.

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Competitive Advantages

- Significant reduction in energy costs due to operation at lower temperatures than those required in conventional metal and ceramic processing.
- Capability to manufacture extremely thin wall thicknesses.
- Possibility of tailoring the final porosity, enabling profiles with permeability properties according to specific needs.
- Scalable and versatile technology that broadens the range of applications across multiple sectors: biomedical, aerospace, automotive, etc.

Technology readiness level:

Under development. Laboratory tests completed. TRL 5.

Intellectual and Industrial Property Status:

Trade secret – know-how.

Type of collaboration sought:

Technical Cooperation Agreements or Commercial Agreements with technical assistance are sought with companies producing ceramic or metal parts that are interested in incorporating the technology to develop their products.