

A method to manufacture porous metal mats for catalysis and energy applications

Proposed use

A novel method to fabricate porous metal mats with high porosity, variable/controllable thicknesses, high surface area and good mechanical strength. They can act as a substrate for electrochemical reactions or catalysis. Potential fields of use include for instance: energy (electrode manufacture for energy devices such as lithium-ion batteries, electrolyzers and fuel cells) and catalysis (manufacturing industrial catalyst and catalyst support).

Problem addressed

Conventional methods of producing porous metals (metal foam) are only able to produce $<500 \text{ cm}^{-2}$ specific surface area (SSA) material. This is insufficient for application in fields such as catalysis, lithium-ion batteries, fuel cells and electrolyzers; in which performance is proportional to the SSA. Finding a mechanically strong and high-SSA porous metal substrate has been a key challenge in the further development of these fields.

Technology overview

This method uses electrospinning to fabricate the metal mats. Electrospinning provides a simple and versatile way for generating nanofiber-based free-standing films from a rich variety of materials. The prepared metal mats have adjustable pore size (0.1~5 μm), high porosity (80-90 vol%), high specific surface area ($>10000 \text{ cm}^{-2}$), and controllable thickness (0.05 - 10 mm).

The raw materials used in the fabrication method are inexpensive and easily accessible. Additionally, the method can be easily scaled up, as all needed equipment is commercially available.

Intellectual property information

GB Priority Application (Number: 2210835.1)

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Benefits

- Can be used as electrodes of batteries, fuel cells and electrolyzers
- Can be used as catalysis or catalysis support
- High specific surface area ($> 500 \text{ cm}^{-2}$)
- Controllable Thickness (0.05 to 10 mm)
- Strong mechanical properties
- Variable Metal compounds (e.g. nickel, copper, iron, zinc and aluminium)
- The manufacture method can be easily scaled-up
- Cheap and easy-accessible raw materials
- Compatible with existing equipment

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