

# IREC<sup>®</sup>

Shaping Energy for a Sustainable Future

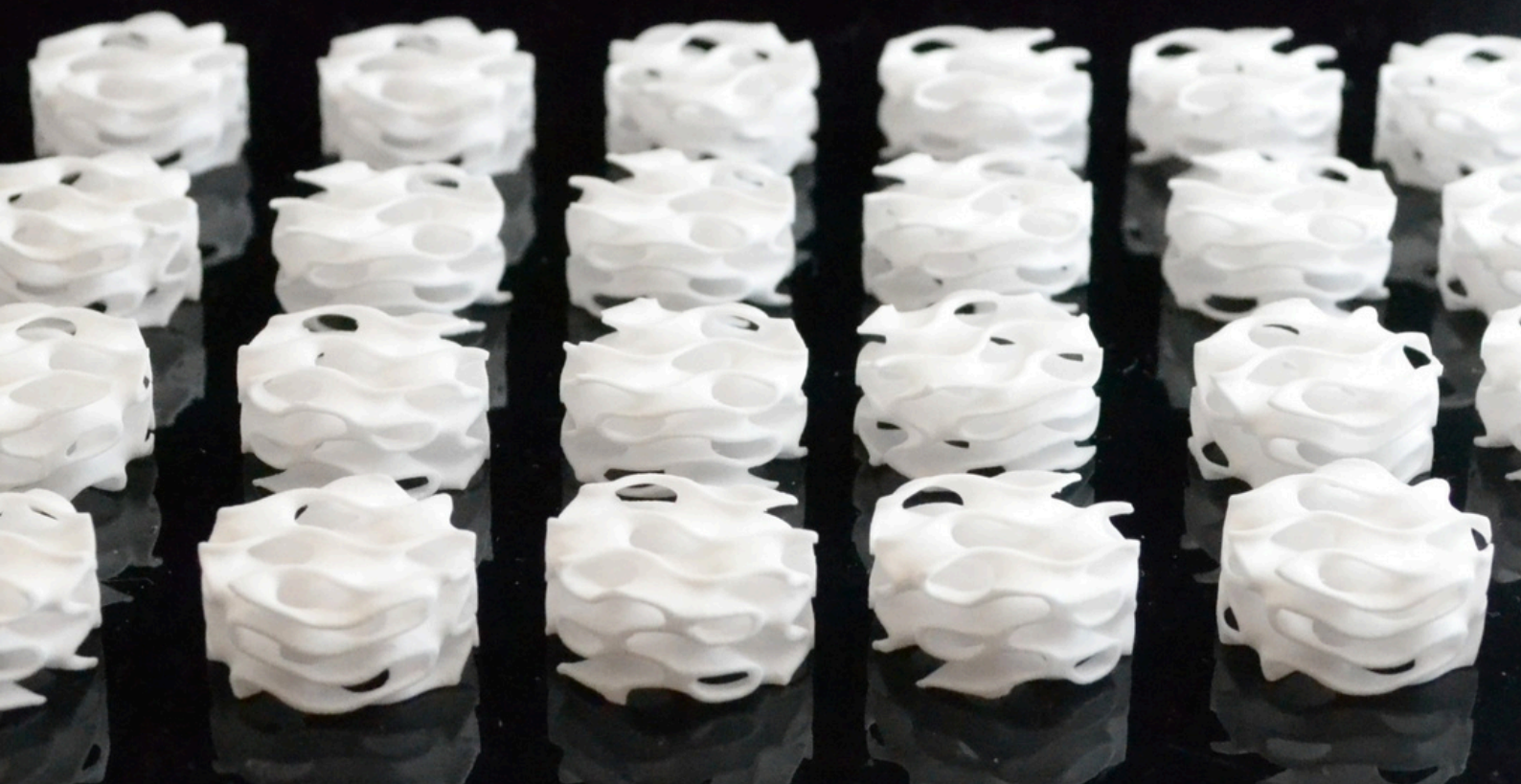
 **energy ceramics lab**  
MANUFACTURING ENERGY CERAMIC DEVICES

# X



# 3DCERAM

# ADVANCING CATALYST DESIGN THROUGH CERAMIC AM



LET'S BUILD  
THE FUTURE OF  
CERAMIC AM  
TOGETHER



**25 YEARS**  
OF EXPERIENCE IN  
TECHNICAL CERAMIC AM



**A.I.**  
MACHINES  
POWERED BY A.I.

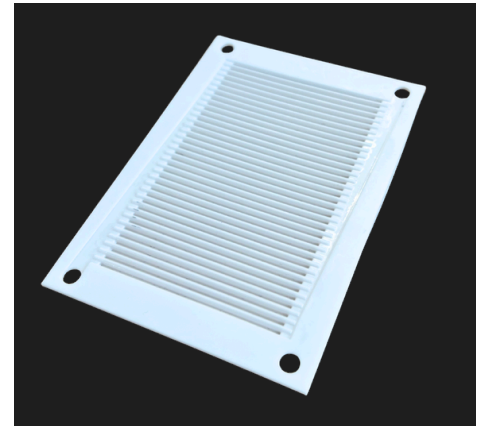


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## RETHINKING CATALYST DESIGN WITH CERAMIC AM

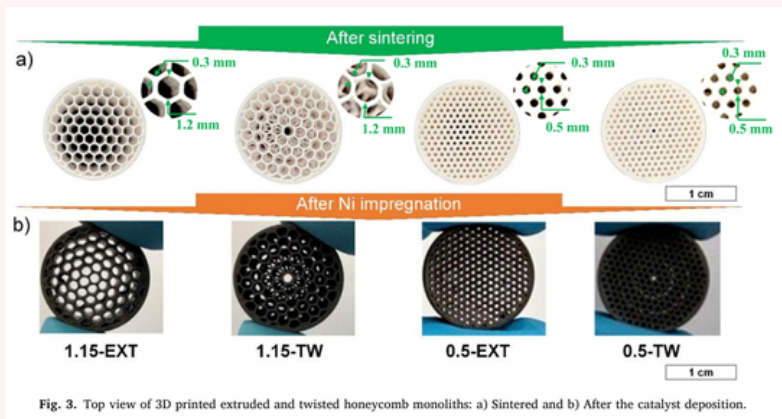
Conventional catalyst supports are typically manufactured by extrusion, resulting in straight and parallel honeycomb channels. While widely used, these geometries can limit reactant diffusion and flow distribution, restricting further improvements in catalytic performance.

Ceramic additive manufacturing removes these design constraints, enabling complex three-dimensional architectures engineered to improve gas-solid interaction, mass transfer and overall reactor efficiency.



[Read IREC's Study here](#) ➔

### IREC STUDY: 3D PRINTED ALUMINA CATALYST SUPPORT



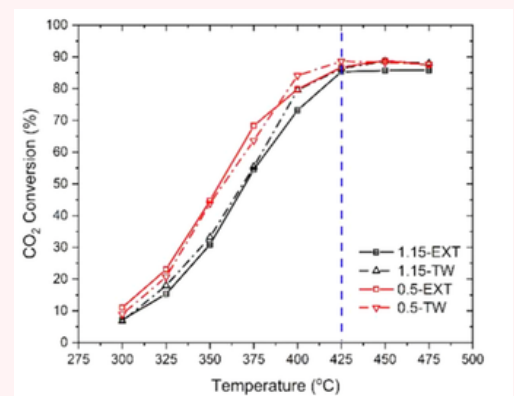
IREC designed and tested straight and twisted alumina monoliths manufactured on a 3DCERAM CERAMAKER C900 using 3DMIX-AL.

The twisted geometries were developed to modify gas flow, enhance mass transfer and improve contact between reactants and the active catalyst phase.

### KEY RESULTS

**84% CO<sub>2</sub> CONVERSION AT 400°C**  
with the optimized 0.5 mm twisted geometry.

**+34% GEOMETRIC SURFACE AREA**  
compared with the simplest straight-channel design.



[Read IREC's Study here](#) ➔

### WHY SLA TOP-DOWN MAKES THE DIFFERENCE

#### TRADITIONAL BOTTOM-UP SLA LIMITATIONS



- ⊗ Pulling forces on the parts
- ⊗ Limited for large / heavy parts
- ⊗ Less stable for complex internal geometries

#### 3DCERAM SINTO TOP-DOWN ADVANTAGES

- ✓ No printing support
- ✓ No peeling forces - higher process stability
- ✓ Capable of producing large & dense parts
- ✓ Freedom to create complex internal geometries
- ✓ Excellent repeatability and reliability
- ✓ Homogeneous material properties after sintering

### BENEFITS FOR THE APPLICATION

-  **ENHANCED MASS TRANSFER**  
Improved reactant access to catalytic sites
-  **OPTIMIZED GAS FLOW**  
Twisted channels promote turbulence
-  **HIGHER CATALYTIC PERFORMANCE**  
Up to 84% CO<sub>2</sub> conversion at 400°C
-  **BETTER MATERIAL EFFICIENCY**  
High performance with lower catalyst loading



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