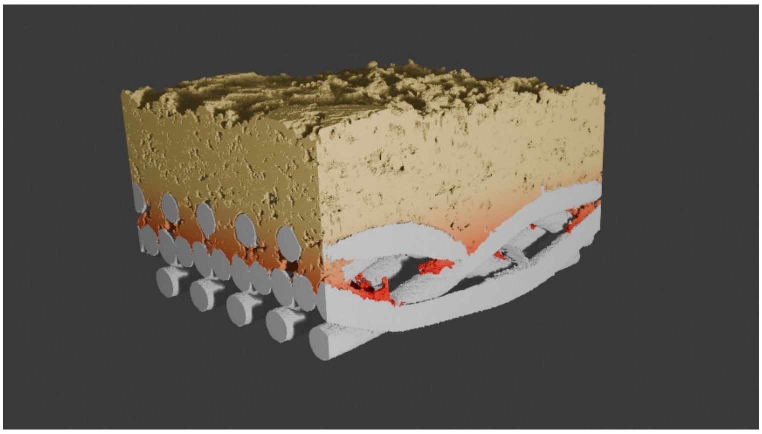

Ceramic topped Mesh for Electrolysis

Image description: The image description is a core element for the evaluation of the images by the jury. Please provide information about the following topics:

How was the image captured and (if applicable) colored?

The image shows a small section (1.3 x 0.9 x 0.7 mm³) of a larger sample (42 x 42 x 0.7 mm³) used for actual electrochemical testing in an alkaline electrolysis cell. The entire sample was integrated into a computer tomograph, but only the part shown was recorded. The tomogram was then loaded into Dragonfly 3D World and segmented into its two components; a contour mesh was created for each and exported as an STL file. The exported files were loaded into Blender, where color grading and rendering were performed. The color gradient indicates (the redder the color, the deeper the penetration) how far the ceramic penetrates into the mesh.

For what application was the image taken?

This image is relevant to advanced alkaline electrolysis. From top to bottom, it features a supported, all-ceramic diaphragm that separates hydrogen and oxygen gases in the electrolysis cell. Suppressing gas mixing ensures safe operation for green hydrogen production. The ceramic nature enables increased operating temperature and the porous structure ensures ionic conductivity.

What makes this particular image special?

A key feature is a purely ceramic diaphragm supported on a fine Ni weave support. The 3D view shows how the layer forms on the fabric during plasma spraying. Particles partly enter the weave, get trapped at different depths, and fill pores. The fabric structure controls how a continuous layer forms, with particles building up step by step across multiple levels. The surface also reveals the morphology of the sprayed ceramic particles.

What scientific insights does one (hope to) gain from such images?

The image helps to better understand how the diaphragm layer forms during plasma spraying, and how particles interact with the fabric. It allows the effective thickness to be measured, which depends on the roughness and structure of the support. It also shows whether the layer is fully closed, and how deep particles penetrate and spread within the fabric. From this, links between structure and performance can be derived, and manufacturing conditions can be improved. This opens the path to thinner diaphragms with lower resistance, better ion transport and higher efficiency in the electrolysis cell, which could make the alkaline electrolysis cheaper than the polymer electrolyte membrane.

Modality used to take the image

The image was recorded using a Xradia 410 Versa X-ray computer tomograph from Zeiss (Carl Zeiss AG) at 10x magnification.

Please describe the scientific impact of the image and the method used in plain language. On the basis of this text, a decision will be made as to whether the image will progress to the next round *(max. 200 characters including spaces, no acronyms)*

The tomogram shows how new ceramic diaphragms bond on nickel mesh through plasma spraying to form thinner layers, which improves performance for green hydrogen production using alkaline electrolysis.

Short image description *(max. 200 characters including spaces, no acronyms)*

From yellow to red, the ceramic penetrates deeper into the nickel mesh, giving insights of the mesh width/penetration depth trade-off for a better design of the diaphragms for alkaline electrolysis.