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Abstract Formulary

Presentation type: **Oral** ✔ **Poster** ✔

Title: Bimetallic two-dimensional aerogel: Developing a revolutionary material for flexible electronics

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ABSTRACT (Space limited to 2200 characters)

Continuous advancement of science and technology in the field of flexible devices compels researchers dedicate themselves to seeking candidates for new flexible transparent conductive films (FTCFs). FTCF is an essential component behind flexible electronics such as organic light-emitting diodes, touch screens, organic photovoltaics, and wearable devices. In last several decades, indium tin oxide (ITO) was a popular material in field of flexible electronics, however its toxicity, brittleness, and expensiveness prompted scientists to look for new FTCF. We expect that our recently developed two-dimensional (2D) metal aerogel can compete with current FTCFs.

As a newcomer, 2D metal aerogels were found very recently [1]. The possession of high transparency, relatively low sheet resistance and good stretchability confirmed their possible application as a FTCF [2]. Two crucial properties of FTCF are electrical and optical performances and based on research made by Hiekel et al. [1], it was shown that it was possible to obtain 2D gold aerogels with transparency around 86% and sheet resistance around 95 Ω/sq, which meets the basic requirements of most flexible devices. However, so far only gold 2D metal aerogels with low coverage area have been investigated. Moreover, investigation of formation mechanism of these 2D structures has not been done, which complicate the design and morphology control for specific devices.

Therefore, in this work we demonstrate for the first time a new large-scale synthesis of bimetallic PtNi 2D metal aerogels with the possibility to control their morphology during the synthesis (Fig. 1). We also investigate the conductivity improvement of the obtained monolayered structures with areas of up to 6 cm2 by stacking, increasing the number of monolayers and sacrificing optical transparency. The present work not only expands and enriches the structural diversity of metal aerogels, but also emerges new materials for further applications as FTCFs.

References:

1. Hiekel, K., Jungblut, S., Georgi, M. & Eychmüller, A. Tailoring the Morphology and Fractal Dimension of 2D Mesh-like Gold Gels. Angew. Chem. Int. Ed. 59, 12048 – 12054 (2020).