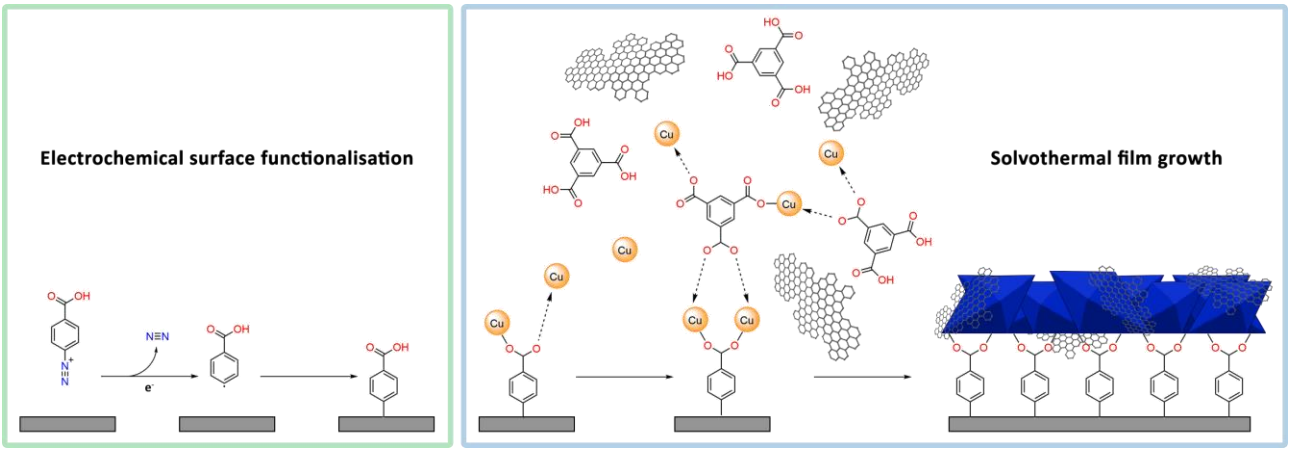
Solvothermal Growth of HKUST-1/Graphene Composite Films on Glassy Carbon Electrodes

Paolo Lamagni[1], Birgitte Lodberg Pedersen[1], Anita Godiksen[2], Susanne Mossin[2], Xinming Hu[1], Steen Uttrup Pedersen[1], Kim Daasbjerg[1], Nina Lock[1]

[1] Carbon Dioxide Activation Center (CADIAC), Interdisciplinary Nanoscience Center (iNANO) and Dept. of Chemistry, Aarhus University, Gustav Wieds Vej 14, DK-8000 Aarhus C, Denmark
[2] Dept. of Chemistry, Technical University of Denmark Kemitorvet, DK-2800 Kgs. Lyngby, Denmark
lamagni@inano.au.dk

Based on paddlewheel units composed of Cu^{2+} dimers and trimesic acid (btc) and having a BET specific surface area as high as 2000 m^2 g^{-1}, HKUST-1 is one of the most investigated copper-based metal-organic frameworks (MOFs). Thanks to its highly porous structure, this material shows interesting properties for gas storage [1,2] and catalysis [3,4]. Aiming to use this material, and MOFs in general, for electrocatalytic applications, we focused on developing a procedure to grow stable and conductive MOF coatings to be used as electrodes. Graphene was therefore mixed with HKUST-1 to form a well-dispersed composite material with enhanced electron transfer properties, compared to the parent insulating MOF. The composite films were grown directly on glassy carbon electrodes, which were pre-functionalised by means of diazonium salt electrografting. [5] The well-dispersed inclusion of graphene flakes did not only result in better electron transfer properties, but also in denser. In-depth characterisation of the composite films confirmed the simultaneous presence of both crystalline MOF and graphene phases. The electrochemical stability of the coatings was also verified in acetonitrile-based electrolyte solutions.



The synthetic strategy to produce HKUST-1/graphene conductive coatings on top of glassy carbon electrodes (drawn as grey rectangles) is displayed. For simplicity, charges are not shown, and the structural components are not on scale.

References:
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