



**HAL**  
open science

## Soluble Two-Dimensional Covalent Organometallic Polymers by(Arene)Ruthenium-Sulfur Chemistry

Johann Coraux, Wael Hourani, Valentin Muller, Nedjma Bendiab, Martien  
den Hertog, Roland Salut, Frédéric Cherioux

► **To cite this version:**

Johann Coraux, Wael Hourani, Valentin Muller, Nedjma Bendiab, Martien den Hertog, et al.. Soluble Two-Dimensional Covalent Organometallic Polymers by(Arene)Ruthenium-Sulfur Chemistry. 1st European Conference on Chemistry of Two-Dimensional Materials (Chem2DMat), Aug 2017, Strasbourg, France. hal-02300615

**HAL Id: hal-02300615**

**<https://hal.science/hal-02300615>**

Submitted on 29 Sep 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Soluble Two-Dimensional Covalent Organometallic Polymers by(Arene)Ruthenium-Sulfur Chemistry

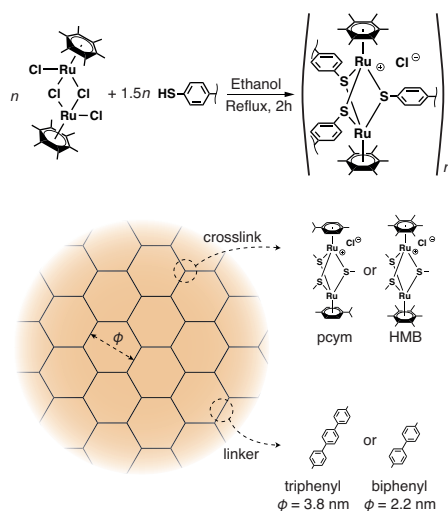
Johann CORAUX,<sup>1</sup> Wael HOURANI,<sup>2</sup> Valentin L. MÜLLER,<sup>1</sup> Nedjma BENDIAB,<sup>1</sup> Martien Den HERTOOG,<sup>1</sup> Olivier LEYNAUD,<sup>1</sup> Roland SALUT,<sup>2</sup> **Frédéric CHERIOUX**<sup>2</sup>

<sup>1</sup>Univ. Grenoble Alpes, F-38000 Grenoble, France, CNRS & Inst NEEL, F-38042 Grenoble, France

<sup>2</sup>Institut FEMTO-ST, CNRS, Univ. Bourgogne Franche-Comté, 15B avenue des Montboucons F-25030 Besancon  
[frederic.cherieux@femto-st.fr](mailto:frederic.cherieux@femto-st.fr)

Conjugated two-dimensional (2D) materials are ultimately thin species, in which the hopping of charge carriers between neighboring atomic sites governs conduction. Graphene, which may be regarded as a giant conjugated molecule, is a typical example. Rich electronic, magnetic, and optical properties are expected in 2D materials with more complex structure and composition than graphene.

Here, a new class of two-dimensional (2D) covalent organometallic polymers, with nanometer-scale crosslinking, is obtained by arene(ruthenium) sulfur chemistry. Their ambivalent nature, with positively charged crosslinks and lipophylic branches, is the key to the often sought-for and usually hard-to-achieve solubility of 2D polymers in various kinds of solvents. Solubility is here controlled by the planarity of the polymer, which in turn controls Coulomb interactions between the polymer layers. High planarity is achieved for high symmetry crosslinks and short, rigid branches. Owing to their solubility, the polymers are straightforwardly processable, and can be handled as powders, deposited on surfaces by mere spin-coating, or suspended across membranes by drop-casting.<sup>1</sup> The novel 2D materials are potential candidates as flexible membranes for catalysis, cancer therapy, and electronics.



*Schematic Representation of the Formation of Sulfur-Linked 2D Covalent (Arene)Ruthenium Polymers from  $[\eta^6\text{-(pcym)RuCl}_2]_2$ ,  $[\eta^6\text{-(HMB)RuCl}_2]_2$ , Dithiophenol-Oligo-*p*-Diphenylene, and Dithiophenol-Oligo-*p*-Terphenylene.*

<sup>1</sup> F. Cherioux, J. Coraux, V. L. Muller, L. Magaud, N. Bendiab, M. den Hertog, O. Leynaud, W. Hourani, S. Lamare, D. Kamaruddin, F. Palmino, R. Salut, *Chem. Eur. J.* **2017**, 10.1002/chem.201700054.