First name: Vincent LAST NAME: LUZET
☐ Oral communication
☒ Poster

ON-SURFACE SYNTHESIS AND CHARACTERIZATION OF KAGOME GRAPHENE

Vincent LUZET,[1] Frédéric CHERIOUX, Remy PAWLAK,[2] Khalid N. ANINDYA,[3] Outmane CHAHIB,[2] Jung-Ching LIU,[2] Paul HIRET,[2] Laurent MAROT,[2] Ernst MEYER,[2] Alain ROCHEFORT[3]

[1] *Université Marie et Louis PASTEUR, CNRS, FEMTO-ST - Besançon (frederic.cherioux@femto-st.fr)*
[2] *Department of Physics, University of Basel, Basel 406, Switzerland*
[3] *Département de génie physique, Polytechnique Montréal, Montréal (Québec) – H3C 3A7, Canada.*

Keywords: Kagome graphene, on-surface synthesis, AFM, STM

Summary:

Kagome graphene (KG),1−3 a two-dimensional (2D) arrangement of corner-sharing graphene triangles, is long regarded as an ideal candidate for strongly correlated electron phenomena and frustrated magnetism. Flat bands in Kagome graphene might host strong electron correlations and frustrated magnetism upon electronic doping. However, the porous nature of Kagome graphene opens a semiconducting gap due to quantum confinement, preventing its fine-tuning by electrostatic gates. Here we induce zero-energy states into a semiconducting Kagome graphene by inserting π- radicals at selected locations. We utilize the on-surface reaction of tribromotrioxoazatriangulene molecules to synthesize carbonyl- functionalized Kagome graphene on Au(111), thereafter modified in situ by exposure to atomic hydrogen. Atomic force microscopy and tunneling spectroscopy unveil the stepwise chemical transformation of the carbonyl groups into radicals, which creates local magnetic defects of spin state S = 1/2 and zero-energy states as confirmed by density functional theory. The ability to imprint local magnetic moments opens up prospects to study the interplay between topology, magnetism, and electron correlation in Kagome graphene.

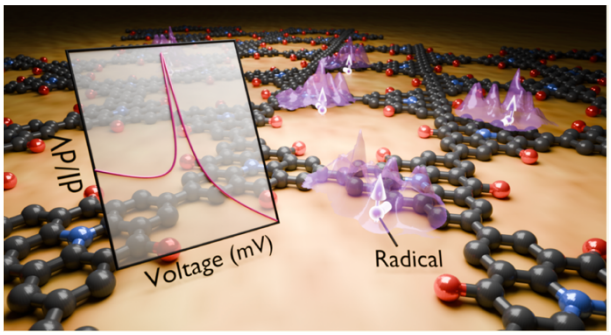

Fig. 1: Artistic representation of Kagome graphene obtained by on-surface synthesis

References:

[1] Steiner, C.; Gebhardt, J.; Ammon, M.; Yang, Z.; Heidenreich, A.; Hammer, N.; G.rling, A.; Kivala, M.; Maier, S. *Nat. Commun.* **2017**, *8*, 14765.
[2] Pawlak, R.; Anindya, K. N.; Chahib, O.; Liu, J.-C.; Hliret, P.; Marot, L.; Luzet, V.; Palmino, F.; Chérioux, F.; Rochefort, A.; Meyer, E. *ACS Nano* **2025**, *19*, 4768-4777