

# Exploring Open-Shell Nanographenes: Magnetism and Reactivity

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Molecular magnetism has gained interest for applications in organic electronics and spintronics. Nanographenes can host unpaired  $\pi$ -electrons, forming delocalized open-shell structures, though their high reactivity makes them difficult to study. On-surface synthesis under ultra-high vacuum enables the formation and stabilization of such open-shell systems on metallic surfaces, while scanning probe microscopy allows detailed structural, electronic, and magnetic characterization.<sup>[1]</sup>

In this talk, I will focus on open-shell nanographenes on metallic surfaces, examining them through two distinct but complementary points of view: their intrinsic magnetism and their chemical reactivity. First, I will present the synthesis of a 2D spin array made up of open-shell nanographenes on an Au(111) substrate. The building block is stable nanographene resulting from an on-surface reaction with an intrinsic monoradical state and is functionalized with 7-azaindole units to promote supramolecular 2D organization.<sup>[2]</sup> To induce more complex spin interactions, cobalt coordination at the chelating sites leads to a 2D metal-organic framework exhibiting competing ferromagnetic and antiferromagnetic order.<sup>[3]</sup>

Secondly, I will address organic radicals as reaction intermediates on surfaces. While free radicals are inherently reactive, a contrast emerges between stable open-shell nanographenes and surface-passivated reaction intermediates. I will show that  $\sigma$ -radicals strongly interact with the surface, whereas  $\pi$ -radicals remain spatially protected and can selectively drive  $\pi$ - $\pi$  coupling reactions.<sup>[4]</sup>

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## References

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