

## Structure, Stability and Electronic Properties of Graphene Edges on Co(0001)

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The rapid development of epitaxial growth of graphene on transition metal (TM) surfaces has been recently exploited to develop nanostructures with well defined edges [1-4]. While armchair edges are preferentially observed for graphene nanostructures grown on weakly interacting surfaces [5] and/or at low temperature [6], straight zigzag edges tend to develop for epitaxial growth on TM substrates, irrespective of the precursor type [1-4]. Mounting evidence also suggests that the electronic properties of graphene are significantly affected. Overall, the factors that control edge orientation, roughness and ultimately functional properties remain poorly understood.

Here we combine low-temperature scanning tunneling microscopy (STM) measurements and DFT calculations to study graphene edge stability and electronic properties, as resulting from the coupling with the substrate. Graphene edges display straight well-ordered structure with zigzag orientation. DFT calculations provide insights into their stability by comparing several edge morphologies with both armchair and zigzag orientation. Simulated images indicate that different edge structures can be clearly distinguished in topography at low bias. The calculated electronic properties for the low energy edge structures are consistent with the measured STS tunneling spectra, which show a prominent edge-localized peak at low bias.

### References

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