

Visualizing formation of tungsten carbide model catalyst and its interaction with oxygen

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Construction of model metal carbide surfaces is essential for surface catalysis studies over carbide-based catalysts. In the present work, well-controlled growth of tungsten carbide (WC_x) layers on W(110) including carbon-rich R(15×3)-C/W(110) and carbon-poor R(15×12)-C/W(110) structures has been clearly demonstrated using chemical vapor deposition (CVD) on a clean W(110) surface or carbon segregation from the bulk. In-situ low-energy electron microscopy (LEEM) and micro-region LEED characterizations confirm that the R(15×12) structure forms first and then transforms to the R(15×3) structure by incorporating more carbon atoms in the CVD or surface segregation processes (Figure 1) [1]. Oxidation of the WC_x /W(110) surfaces in O_2 atmosphere removes surface carbon atoms, driving the structural transformation from R(15×3) to R(15×12), and to a two-dimensional oxide surface. Our work provides a clear guide for well-controlled growth of model WC_x catalysts and the structural transformation between them.

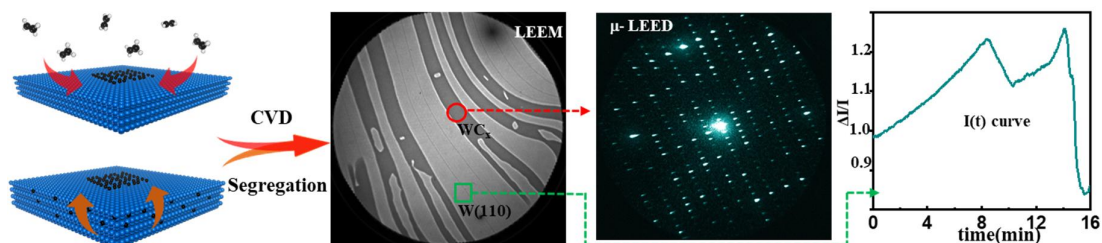


Figure 1. Schemes (including LEEM image, LEED pattern and I-t curve) illustrating the Well-controlled growth of tungsten carbide (WC_x) layers on W(110) using chemical vapor deposition or carbon segregation from the bulk

References

- [1] C. Meng, R. Li, Y. Ning, A. Pavlovska, E. Bauer, Q. Fu and X. Bao, *ChemCatChem*, 2020, **12**, 1036-1045.