

1 **Supporting Materials**

2 **Revealing the dynamic formation mechanism of porous Mo₂C: an *in-situ* TEM**
3 **study**

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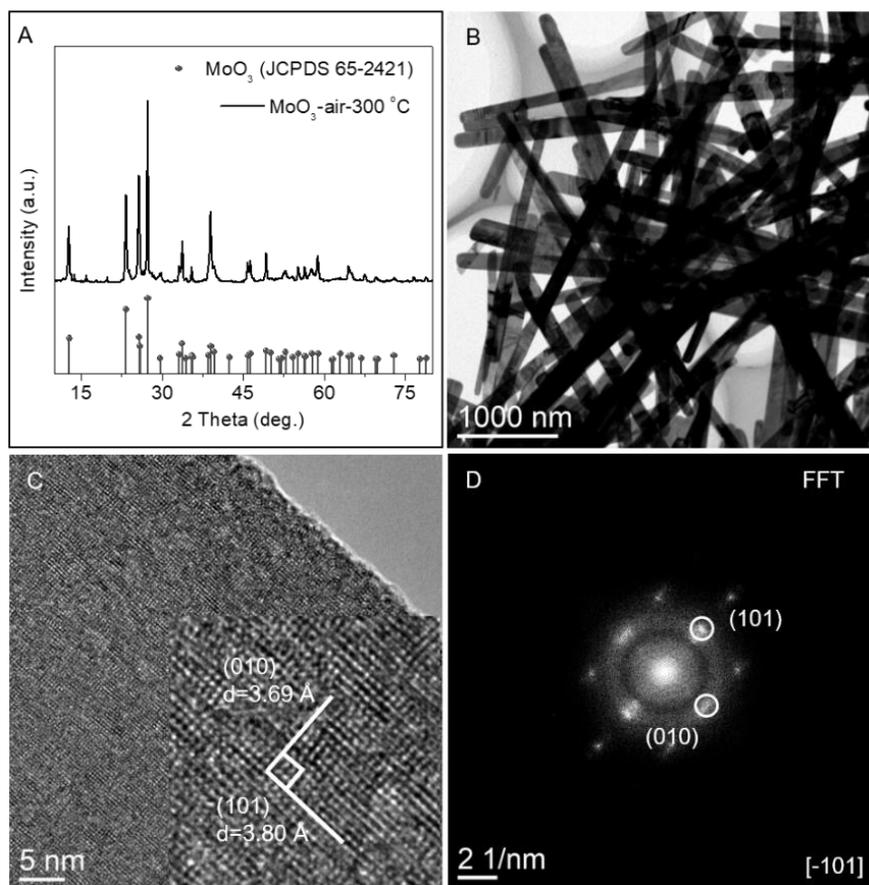
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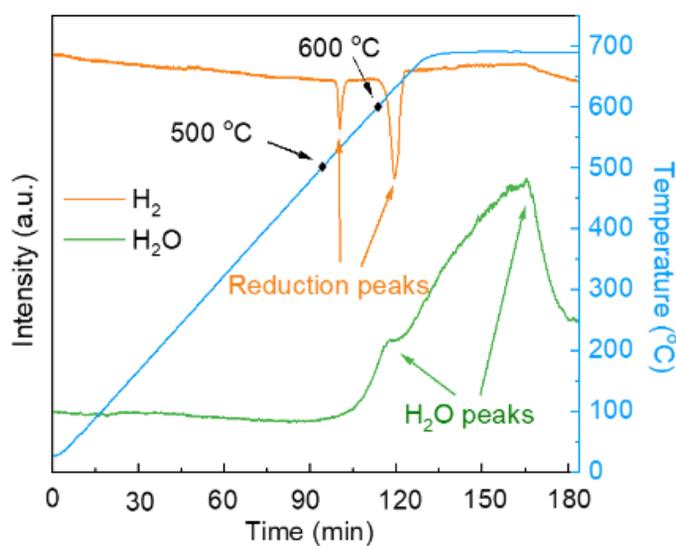
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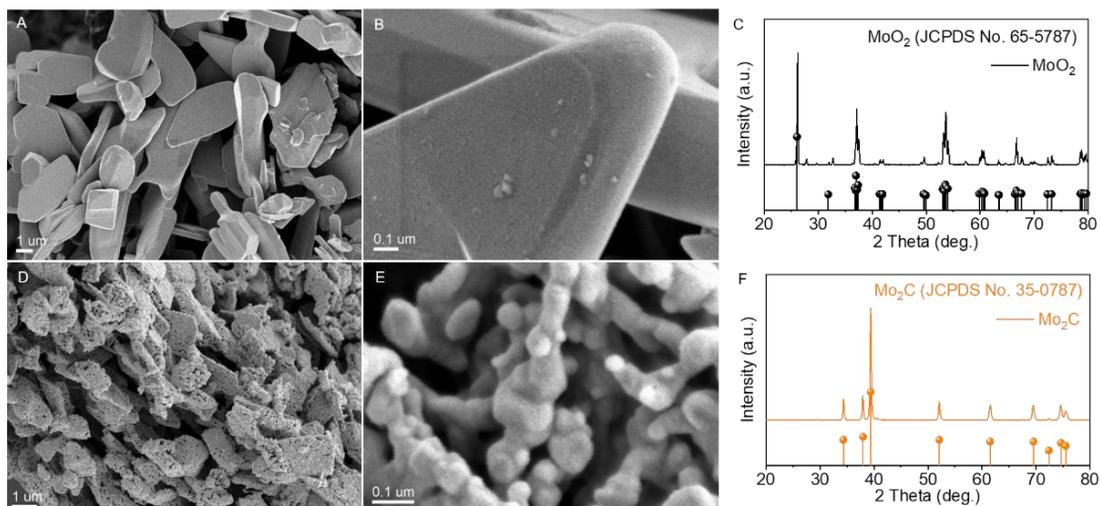
21 **Supplementary Figure 1.** Typical XRD pattern (A), low-magnification TEM (B),
22 HRTEM (C) images of MoO₃ nanobelts after calcination in air, and the local FFT (D)
23 of the enlarge part in (C).

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26 **Supplementary Figure 2.** TPSR profiles of the carbonization process under 20 vol.%
27 CH₄/H₂ atmosphere.

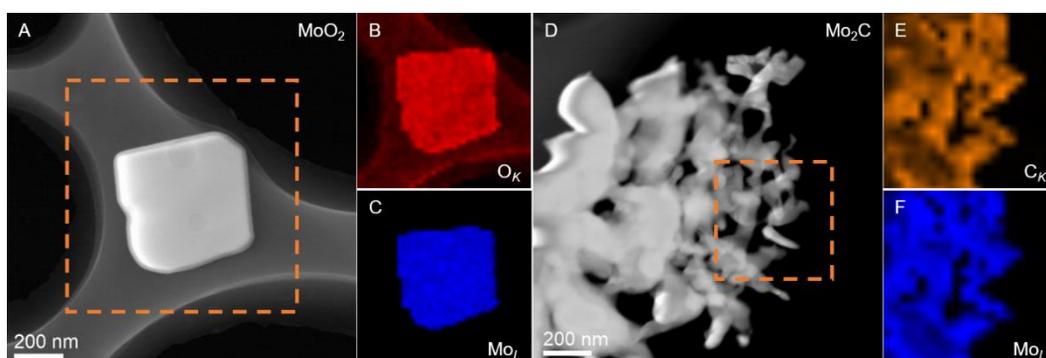


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29 **Supplementary Figure 3.** SEM images and XRD patterns of MoO₂ (A-C) and Mo₂C
30 (D-F) samples, respectively.

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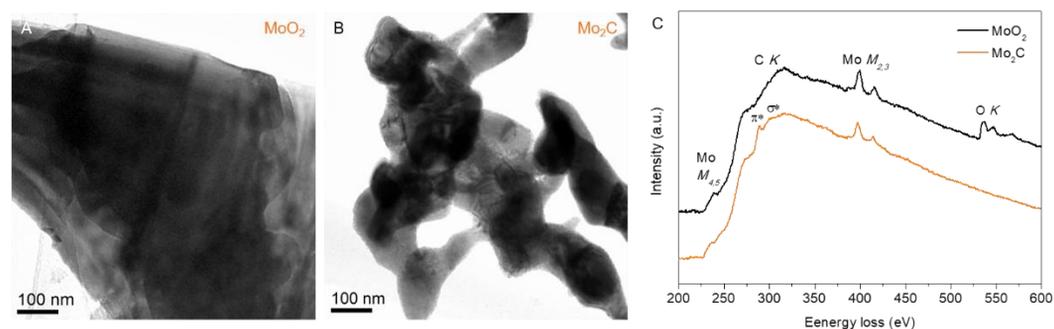


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34 **Supplementary Figure 4.** STEM images and EDX elemental maps of MoO₂ (A-C)
35 and Mo₂C (D-F) samples, respectively.

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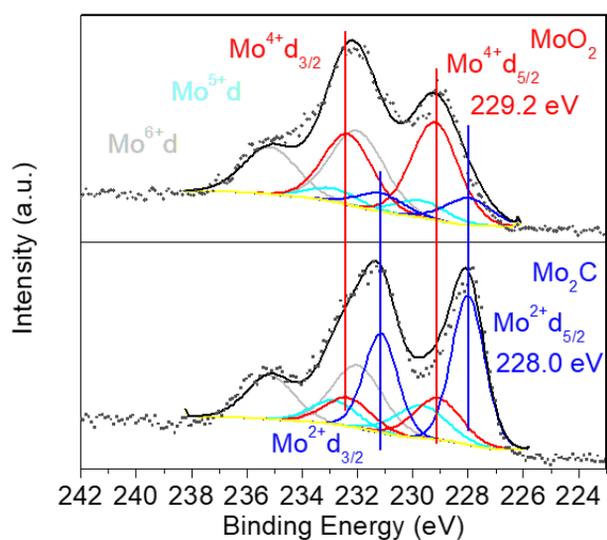


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39 **Supplementary Figure 5.** TEM images of MoO₂ (A) and Mo₂C (B). (C) EEL spectra
40 of MoO₂ and Mo₂C samples.

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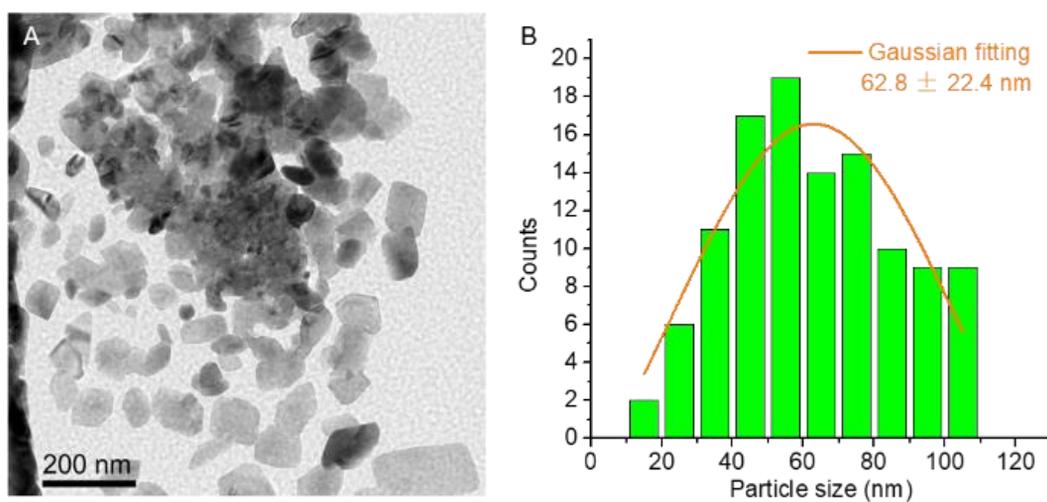
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44 **Supplementary Figure 6.** Mo 3d XPS spectra of MoO₂ and Mo₂C samples.

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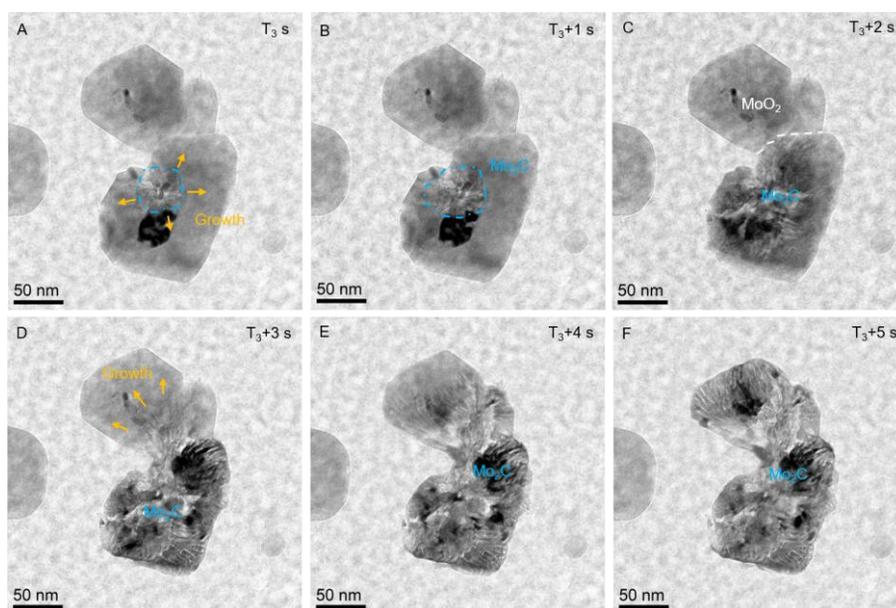


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49 **Supplementary Figure 7.** *In-situ* TEM image (A) of MoO₂ and the corresponding PSD50 histogram (B) under 20 vol.% CH₄/H₂ atmosphere at 600 °C.

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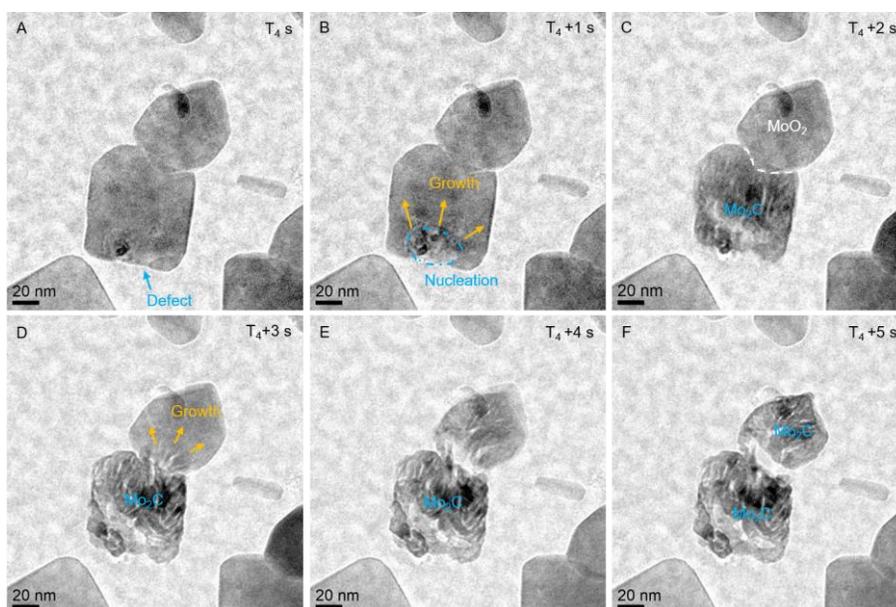


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54 **Supplementary Figure 8.** *In-situ* TEM images of the structural evolution of adjacent
55 MoO₂ NPs to Mo₂C nanocrystals under 20 vol.% CH₄/H₂ atmosphere at 700 °C.

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59 **Supplementary Figure 9.** *In-situ* TEM images of the structural evolution of adjacent
60 MoO₂ NPs to Mo₂C nanocrystals under 20 vol.% CH₄/H₂ atmosphere at 700 °C.

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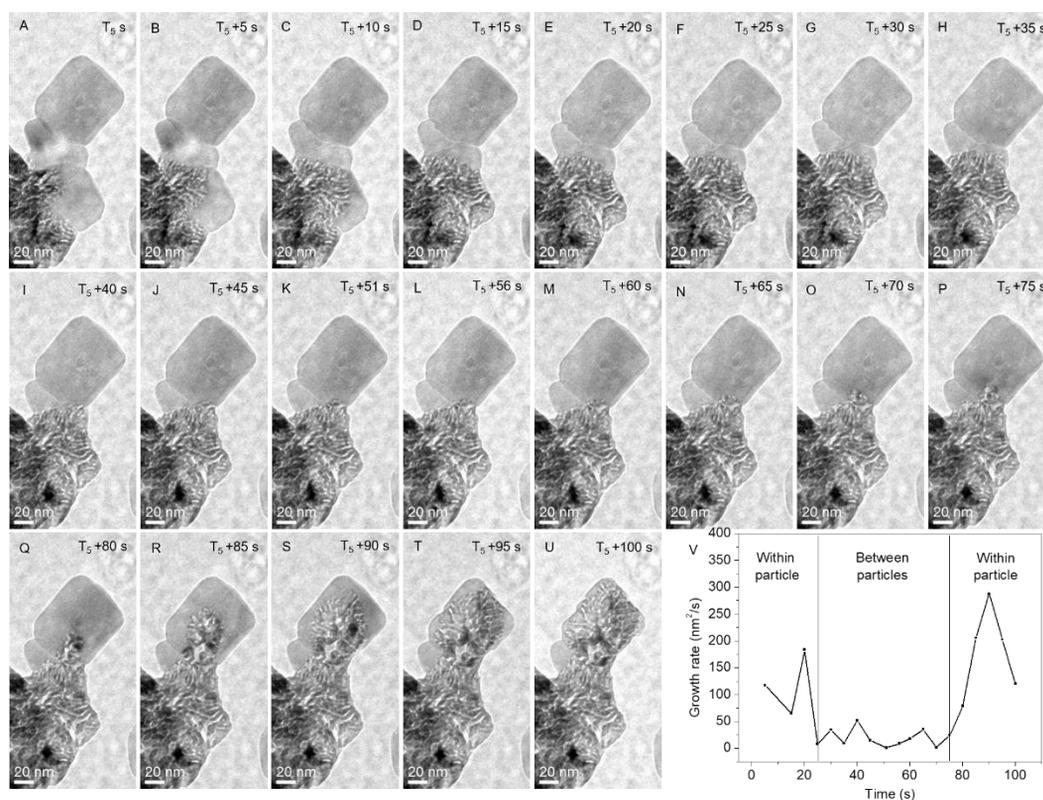


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64 **Supplementary Figure 10.** *In-situ* TEM images regarding the growth process on65 Mo₂C within and between MoO₂ NPs under 20 vol.% CH₄/H₂ atmosphere at 700 °C.

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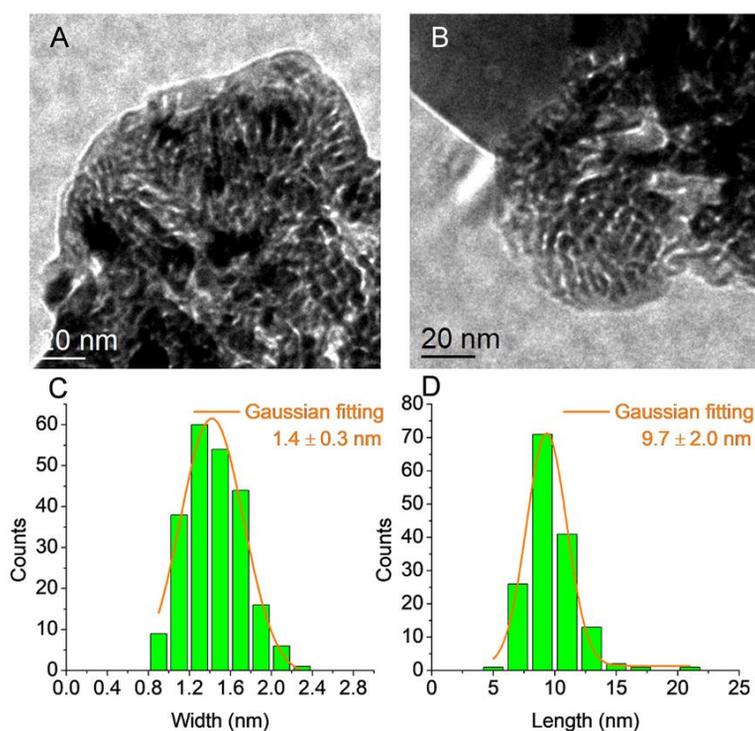


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69 **Supplementary Figure 11.** *In-situ* TEM images regarding the growth rate on Mo₂C
70 within and between MoO₂ NPs under 20 vol.% CH₄/H₂ atmosphere at 700 °C.

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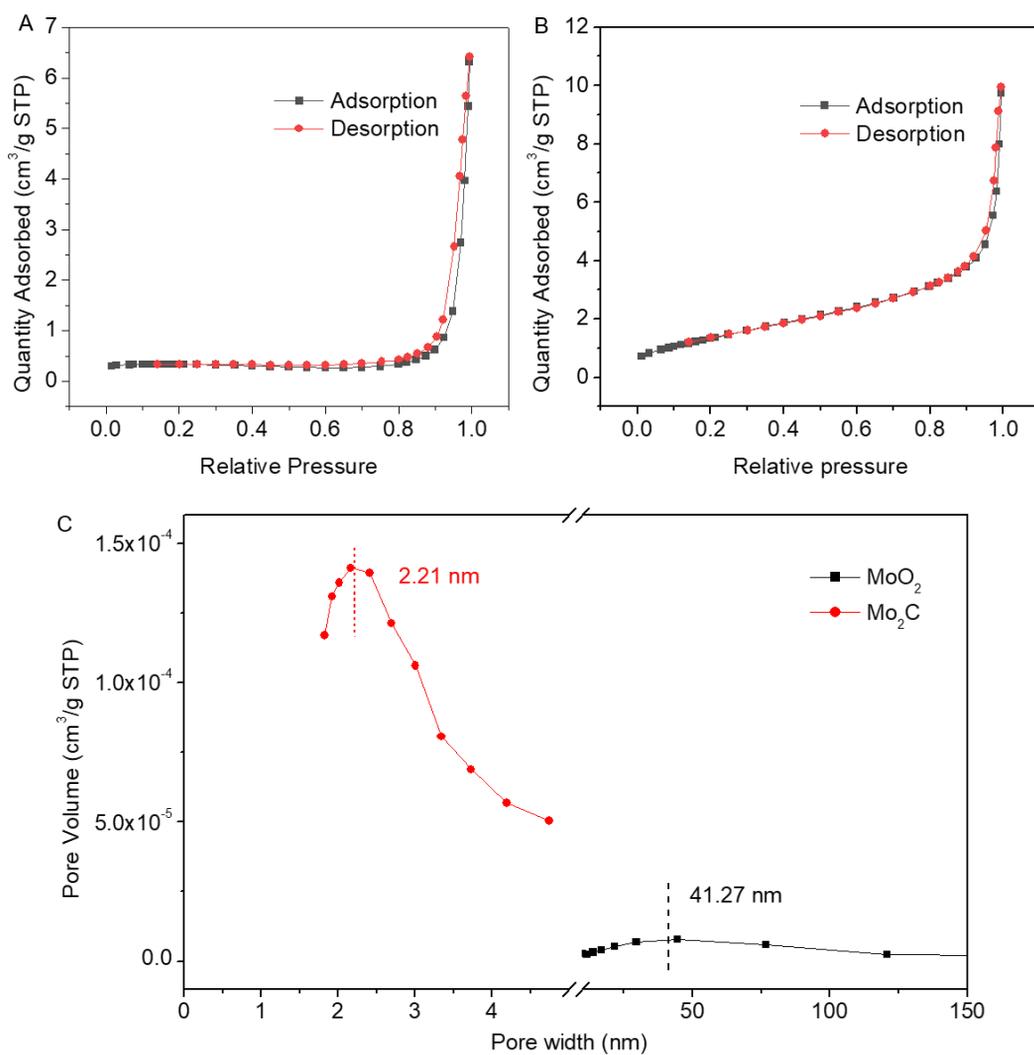


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74 **Supplementary Figure 12.** *In-situ* TEM images (A, B) and statistical analysis of pore
75 width (C) and length (D) of Mo₂C.

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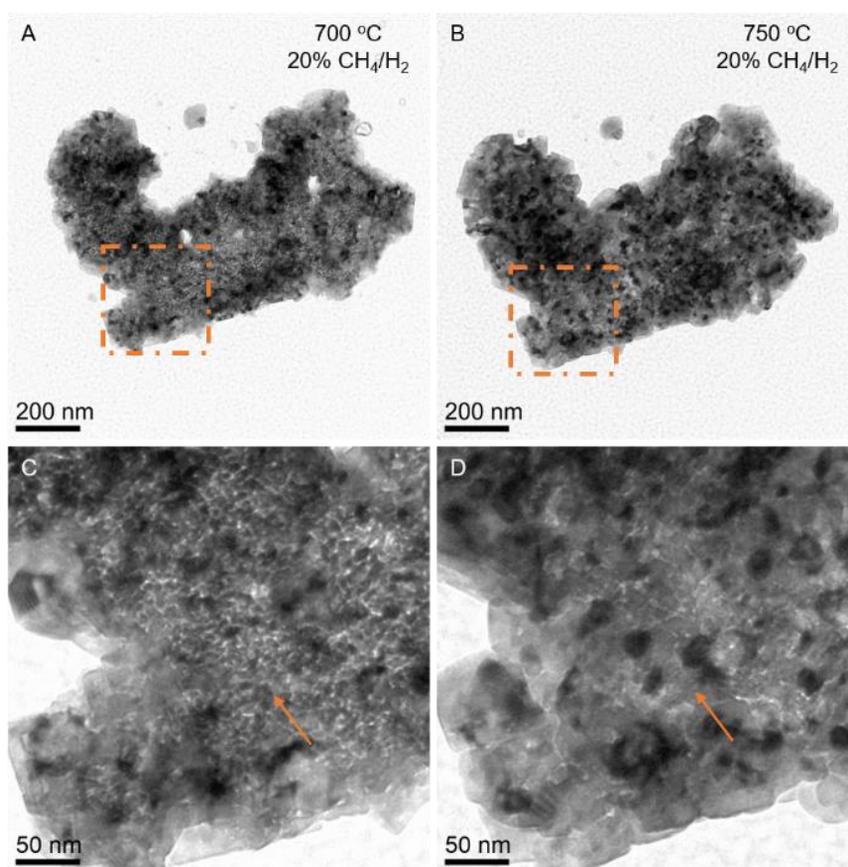


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79 **Supplementary Figure 13.** N₂ adsorption/desorption isotherms of MoO₂ (A) and80 Mo₂C (B) samples. (C) The pore size distributions of MoO₂ and Mo₂C samples.

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85 **Supplementary Figure 14.** *In-situ* TEM images of Mo₂C sample under 20 vol.%
86 CH₄/H₂ atmosphere at 700 °C (A) and 750 °C (B). (C, D) Enlarged TEM images from
87 the dashed boxes in (A) and (B).

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