

Electronic Supporting Information for
Methane to Methanol over Copper Mordenite: Yield Improvement Through Multiple
Cycles and Different Synthesis Techniques

by

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1. Catalytic Activity

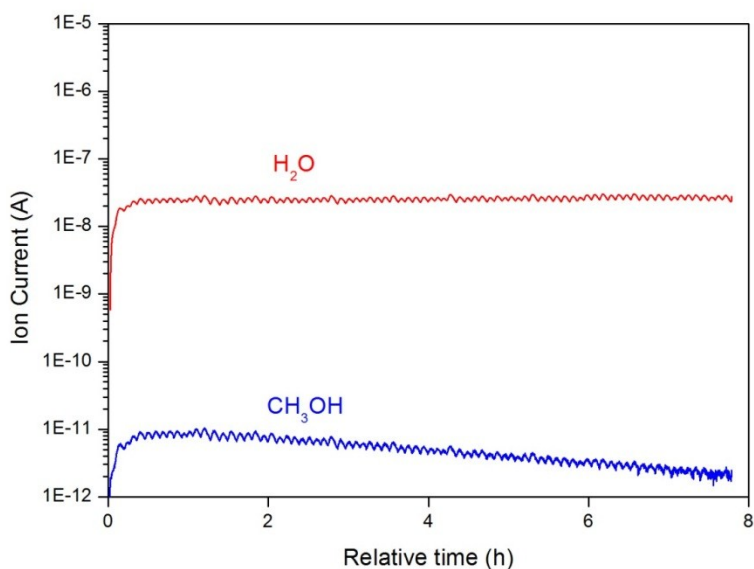


Figure S1 Mass spectrometer-detected signals of H₂O ($m/z = 18$), and methanol ($m/z = 31$) during the treatment of wet He at 200 °C after methane interaction of CuMOR_S during 2nd cycle.

2. N₂ Adsorption

Table S1 BET Number of the materials used in this study

Material	BET surface area [m ² /g]
Na-MOR	411
H-MOR	464
CuMOR _A	386
CuMOR _S	410
CuMOR _A , after 2 cycles of R1	328
CuMOR _S , after 8 cycles of R1	202

3. XAS spectra taken during in situ synthesis of Cu-MOR_s

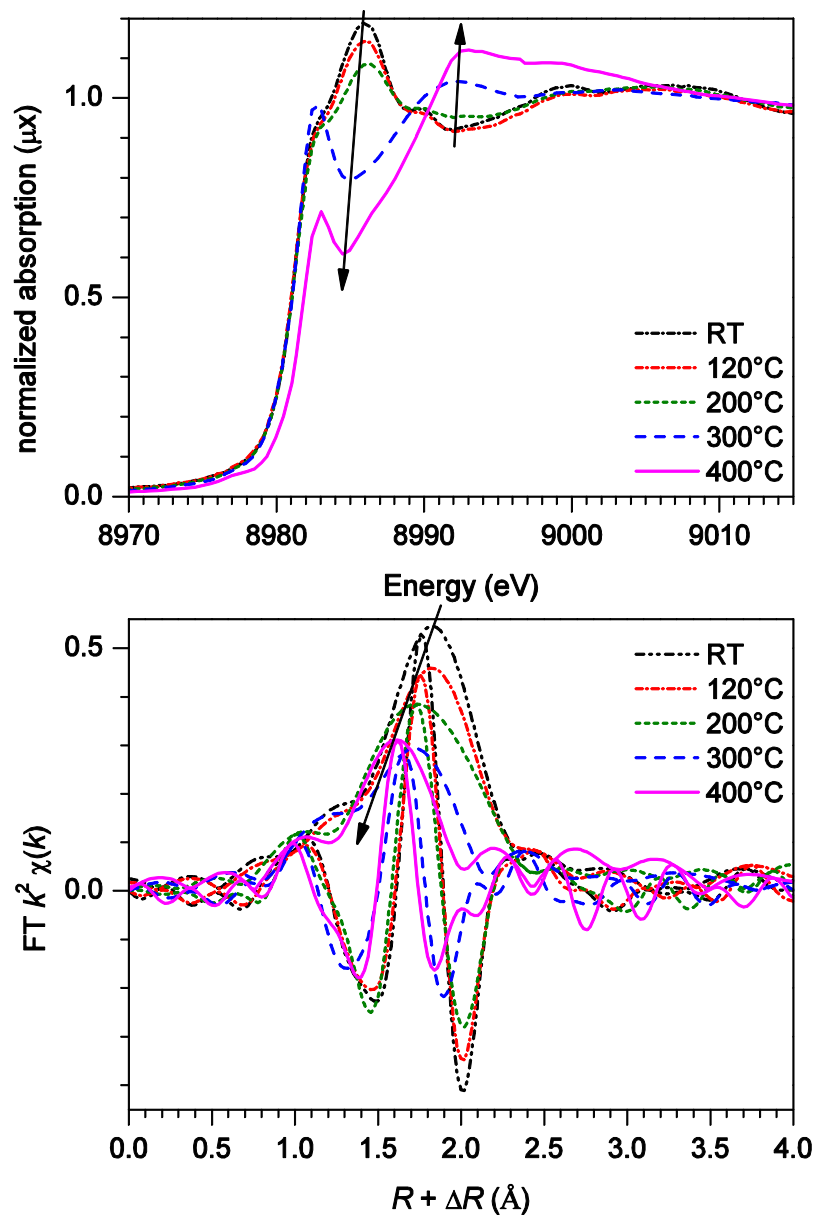


Figure S2 XANES and FT EXAFS spectra taken during in situ synthesis of Cu-MOR by heating of CuCl and H-MOR

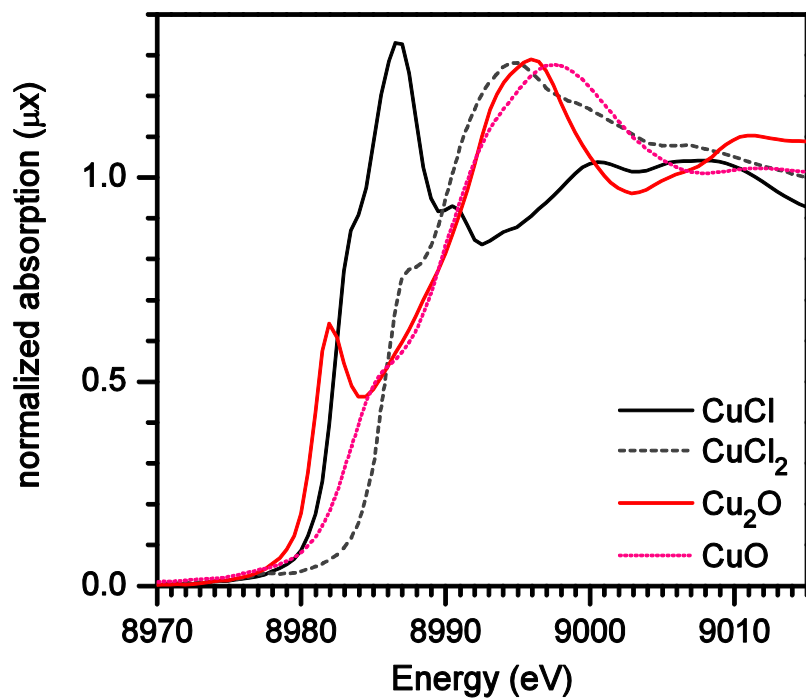


Figure ES3-2. XANES spectra of standard copper compounds

4. Linear Combination Fitting

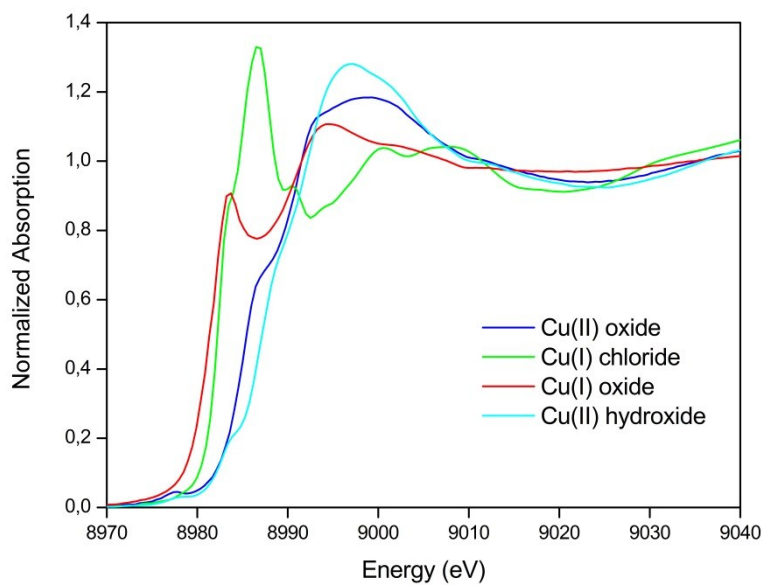


Figure S4 XANES spectra of standard copper compounds used in the LCF.

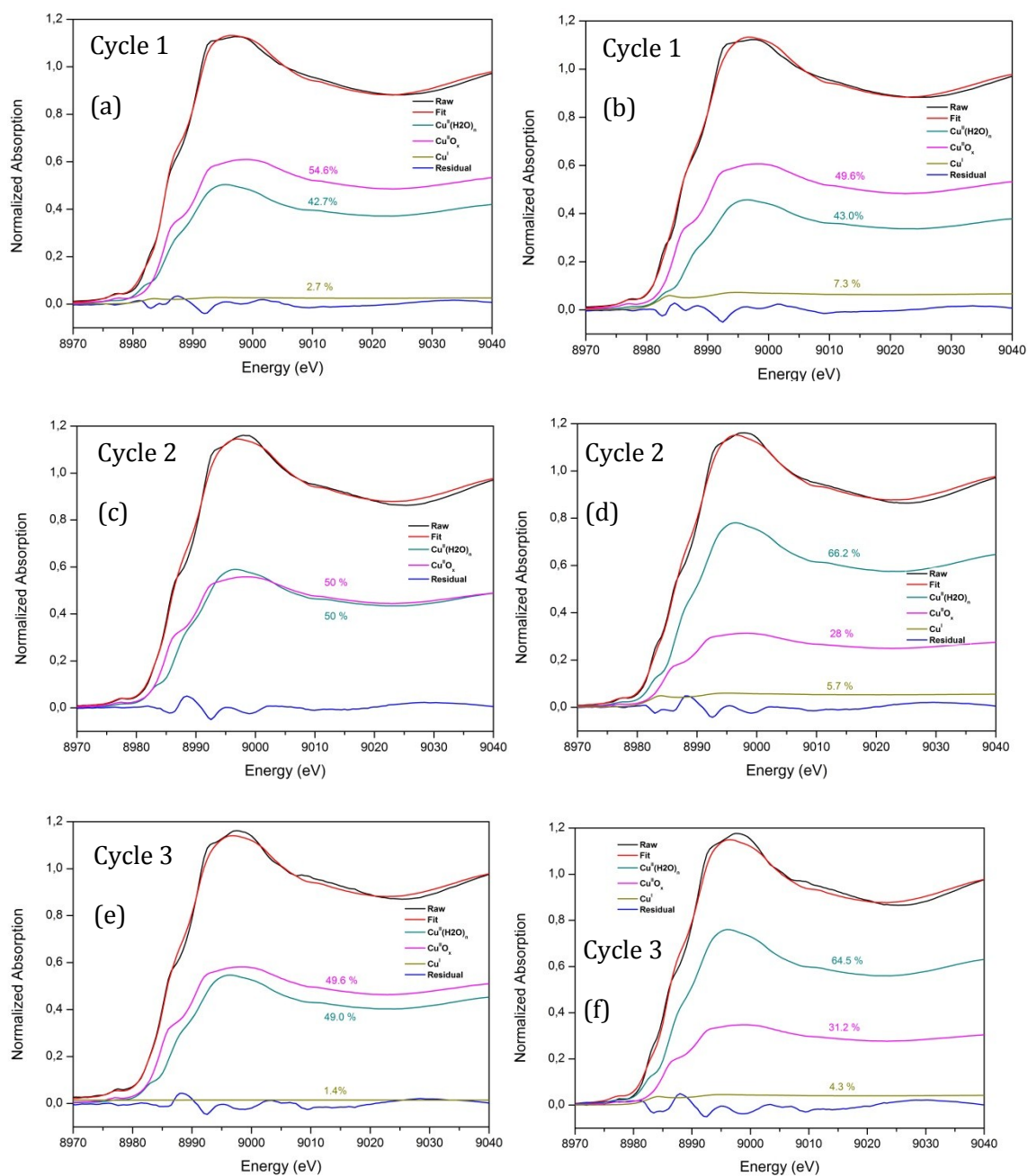


Figure S5 XANES Spectra taken during O₂ activation (a, c, e) and CH₄ reaction (b, d, f) of Cu-MOR₅ at the corresponding cycle with the linear combination fit, its components and the residual.

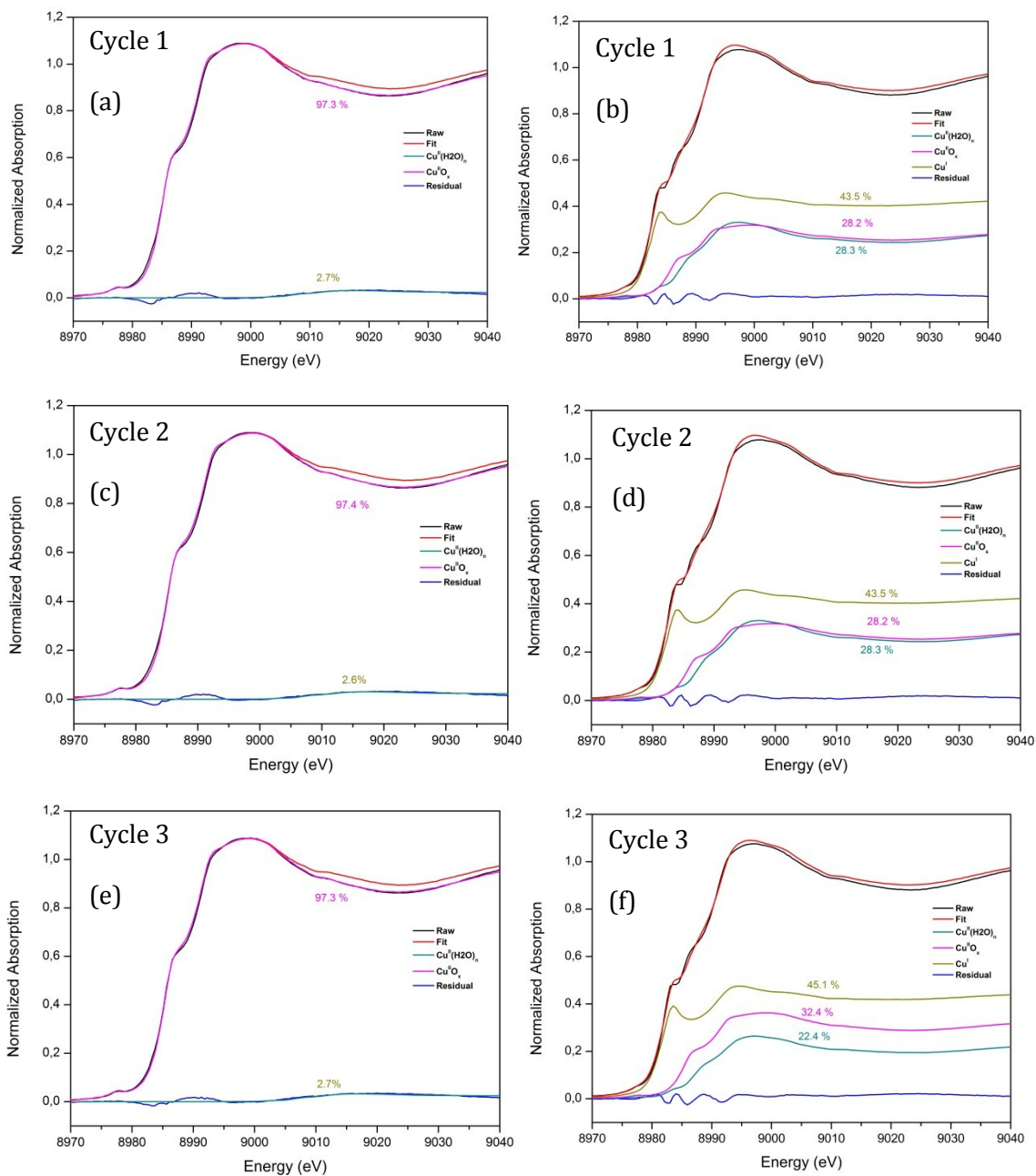


Figure S6 XANES Spectra taken during O₂ activation (a, c, e) and CH₄ reaction (b, d, f) of Cu-MOR_A at the corresponding cycle with the linear combination fit, its components and the residual.