Supporting Information

## Catalytic Oxidation of Methane to Methanol over Cu-CHA with Molecular Oxygen

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Figure S1. Reactor diagram of  $CH_4$ - $O_2$ - $H_2O$  reaction.

(a) CH<sub>4</sub>/CD<sub>4</sub>-O<sub>2</sub>-H<sub>2</sub>O reaction



(b)  $CH_4-{}^{16}O_2/{}^{18}O_2-H_2O$  reaction



(c)  $CH_4 - O_2 - H_2O/D_2O$  reaction



Scheme S1. Reaction schemes of (a)  $CH_4/CD_4-O_2-H_2O$ , (b)  $CH_4-{}^{16}O_2/{}^{18}O_2-H_2O$ , and (c)  $CH_4$  - $O_2-H_2O/D_2O$  reactions.



**Figure S2.** Result of QMS analysis: variation of m/z = 35, corresponding to CD<sub>3</sub>OH, under CH<sub>4</sub>/CD<sub>4</sub>-O<sub>2</sub>-H<sub>2</sub>O reaction. CH<sub>3</sub><sup>18</sup>OH (m/z = 34) under CH<sub>4</sub>-<sup>16</sup>O<sub>2</sub>/<sup>18</sup>O<sub>2</sub>-H<sub>2</sub>O reaction was difficult to distinguish from <sup>17</sup>O<sub>2</sub> (0.8%) contained in the O<sub>2</sub> isotope gas cylinder. Variation of m/z = 33 of CH<sub>3</sub>OD under CH<sub>4</sub>-O<sub>2</sub>-H<sub>2</sub>O/D<sub>2</sub>O reaction was hardly observed probably due to the resolution limits, i.e., due to too strong signal derived from O<sub>2</sub> (m/z = 32).