

**Cooperative effects in ternary Cu-Ni-Fe catalysts lead to enhanced alkene selectivity
in alkyne hydrogenation**

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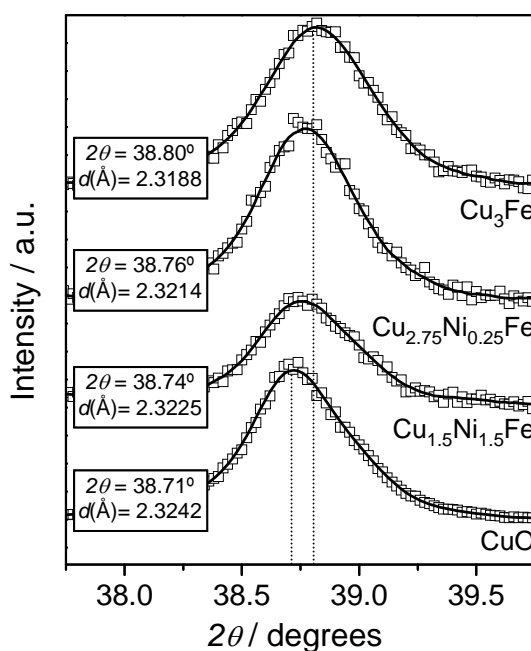


Figure SI1. X-ray diffraction patterns of the mixed $\text{Cu}_{3-x}\text{Ni}_x\text{Fe}$ oxides, focusing on one of the main reflections of CuO. The position of this reflection (2θ and d value) is indicated in each pattern. The shift to lower diffraction angles supports the formation of solid solutions $\text{Cu}(\text{M})\text{O}_x$ with $\text{M} = \text{Fe}, \text{Ni}$.

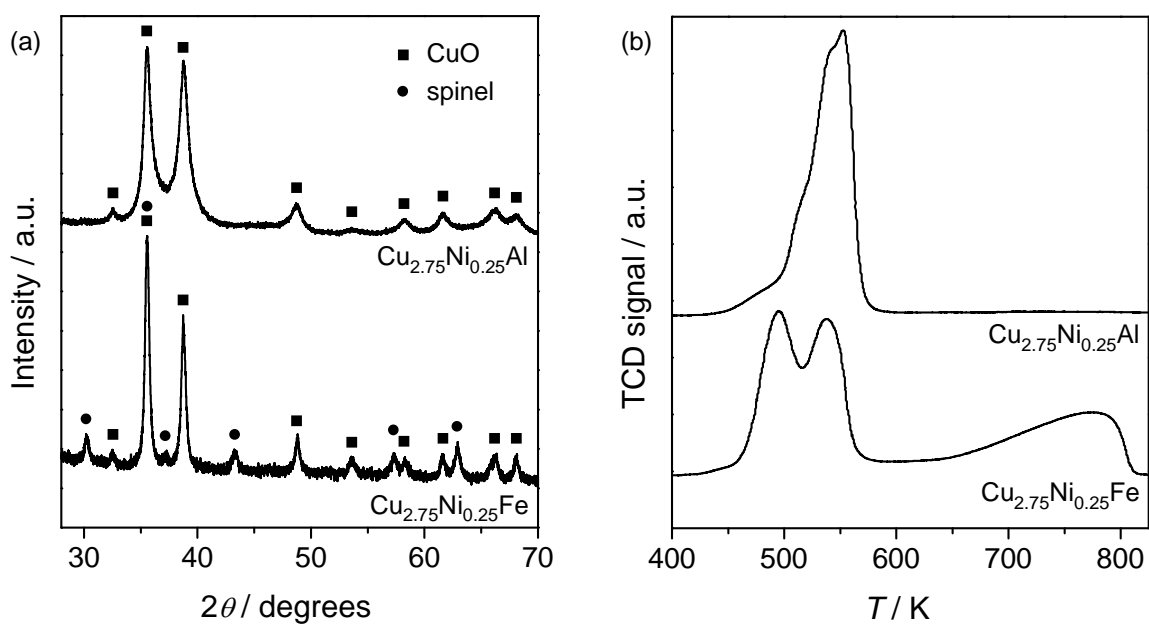


Figure S12. Characterization of the $\text{Cu}_{2.75}\text{Ni}_{0.25}\text{Al}$ and $\text{Cu}_{2.75}\text{Ni}_{0.25}\text{Fe}$ catalysts by (a) X-ray diffraction and (b) temperature-programmed reduction with H_2 .

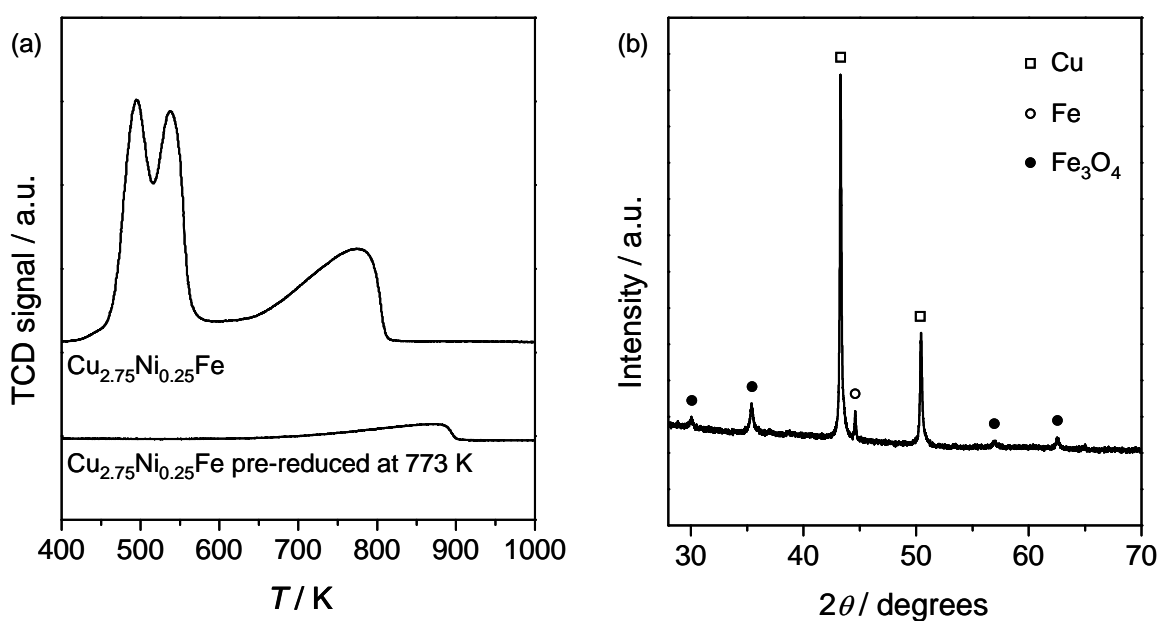


Figure S13. Characterization of the pre-reduced $\text{Cu}_{2.75}\text{Ni}_{0.25}\text{Fe}$ catalyst by (a) temperature-programmed reduction with H_2 and (b) X-ray diffraction). The H_2 -TPR profile of the calcined catalyst is shown for comparison.

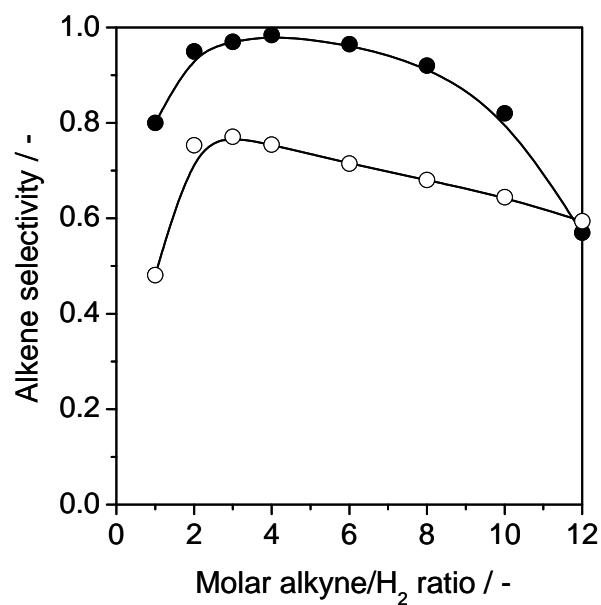


Figure SI4. Selectivity to (●) propene and (○) ethene vs. the molar H₂/alkyne ratio in the feed over Cu_{2.75}Ni_{0.25}Fe. Conditions: 2.5 vol.% C₃H₄ (C₂H₂) and 2.5-30 vol.% H₂, balance He, $T = 523$ K, $SV = 16,800 \text{ cm}^3 \text{ g}^{-1} \text{ h}^{-1}$, and $P = 1$ bar.