

## Supplement Information

### **A Sinter-resistant Catalytic System Based on Ultra-small Ni-Cu Nanoparticle Encapsulated in Ca-SiO<sub>2</sub> for High-performance Ethanol Steam Reforming**

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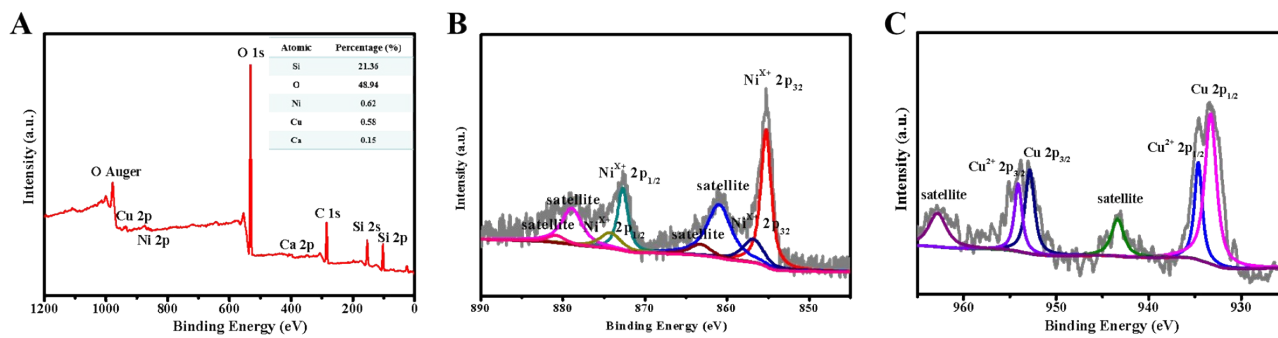


Figure S1 A) XPS survey spectrum B) Ni 2p XPS spectrum, C) Cu 2p XPS spectrum of reactive Ni-Cu@CS.

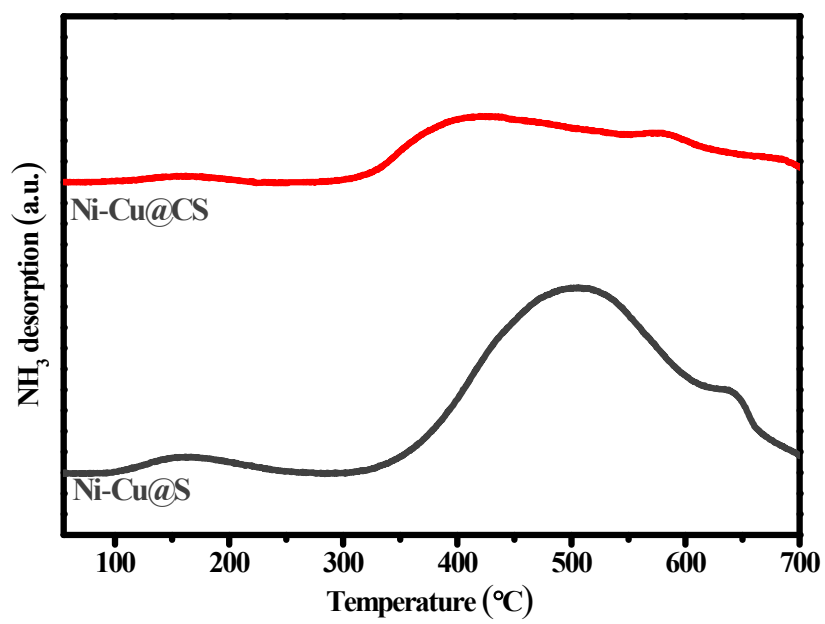


Figure S2 NH<sub>3</sub>-TPD profiles of Ni-Cu@CS and Ni-Cu@S samples.

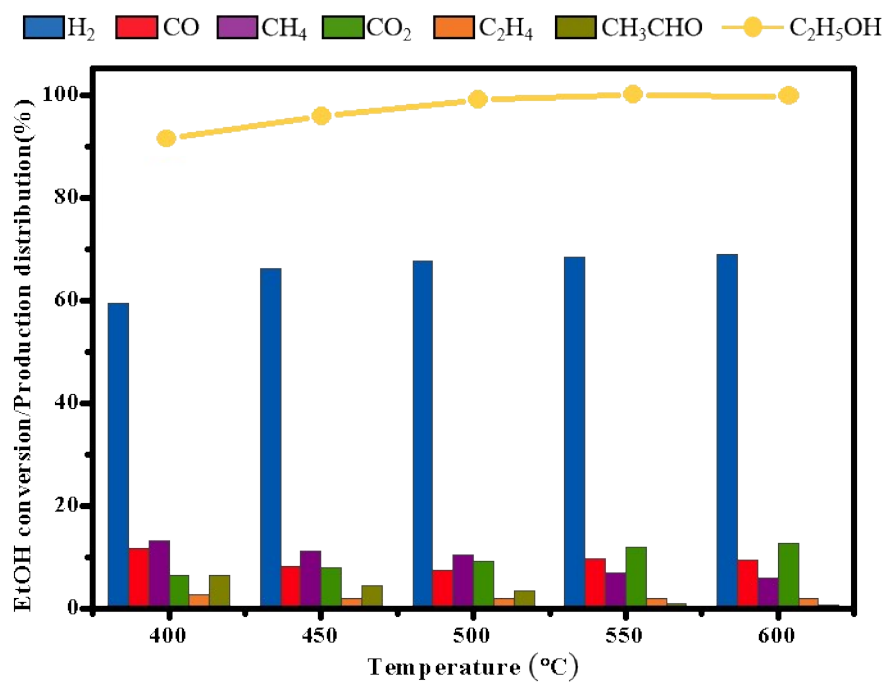


Figure S3 Variation of ethanol conversion and product selectivity as a function of reaction temperature over Ni-Cu@S.