

ZEOLITES AS A TOOL FOR INTENSIFICATION OF MASS TRANSFER ON THE SURFACE OF A COBALT FISCHER–TROPSCH SYNTHESIS CATALYST

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Introduction

Zeolites manifest advantages over most other heterogeneous catalysts. They are widely used in industrial processes as components of the supports for Fischer–Tropsch synthesis catalysts, mainly related to their activity in cracking and isomerization reactions. Such processes, as a rule, are carried out at high pressures and temperatures in a large excess of hydrogen.

Experimental part

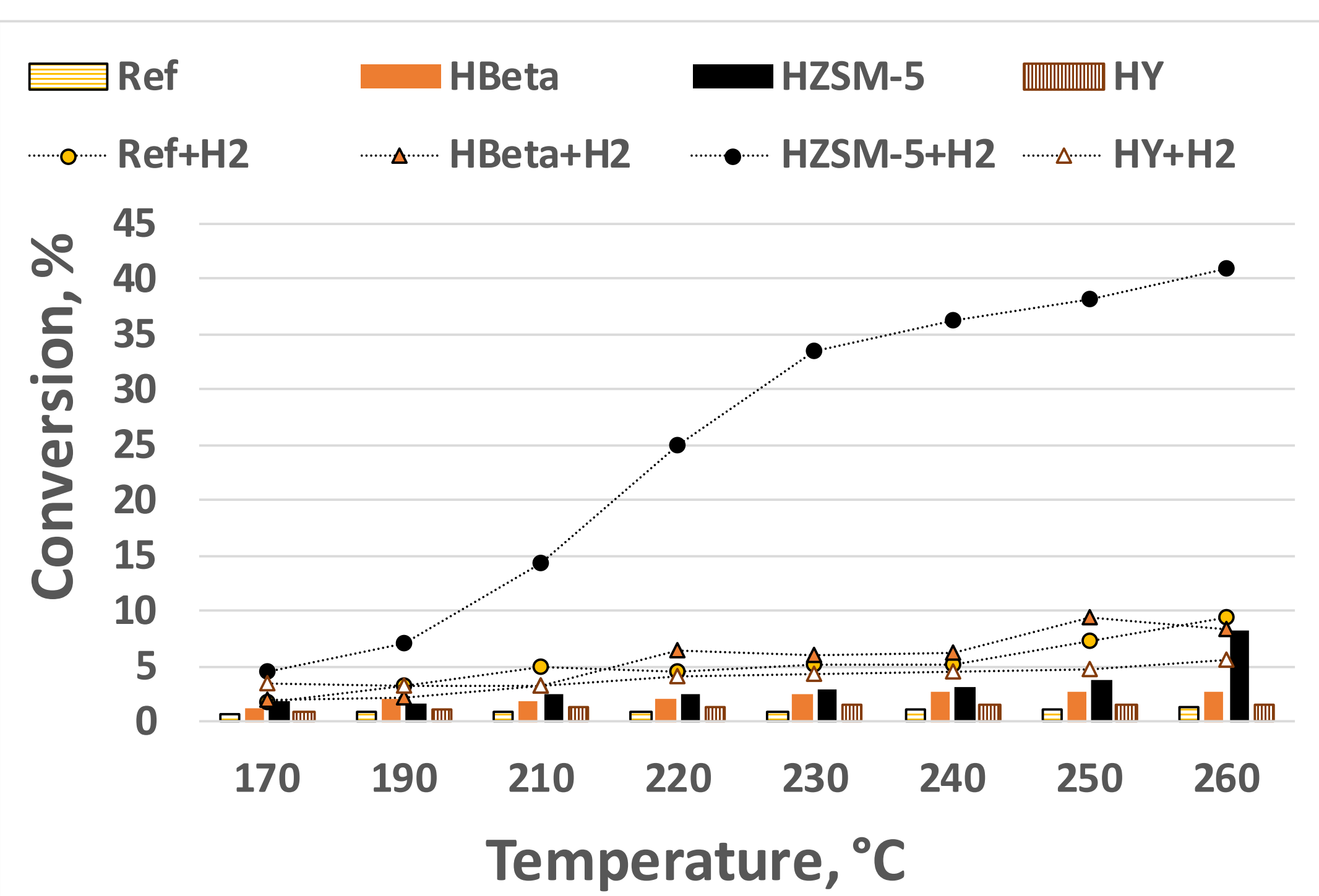
The catalytic experiments were done in a vertical stainless flow reactor at temperature 170–260°C and 0.1 MPa.

Liquid hydrocarbon feedstock + H₂O was injected into He or H₂ (2.5 l/hr) flow at 1+1 ml/hr rate by a syringe pump.

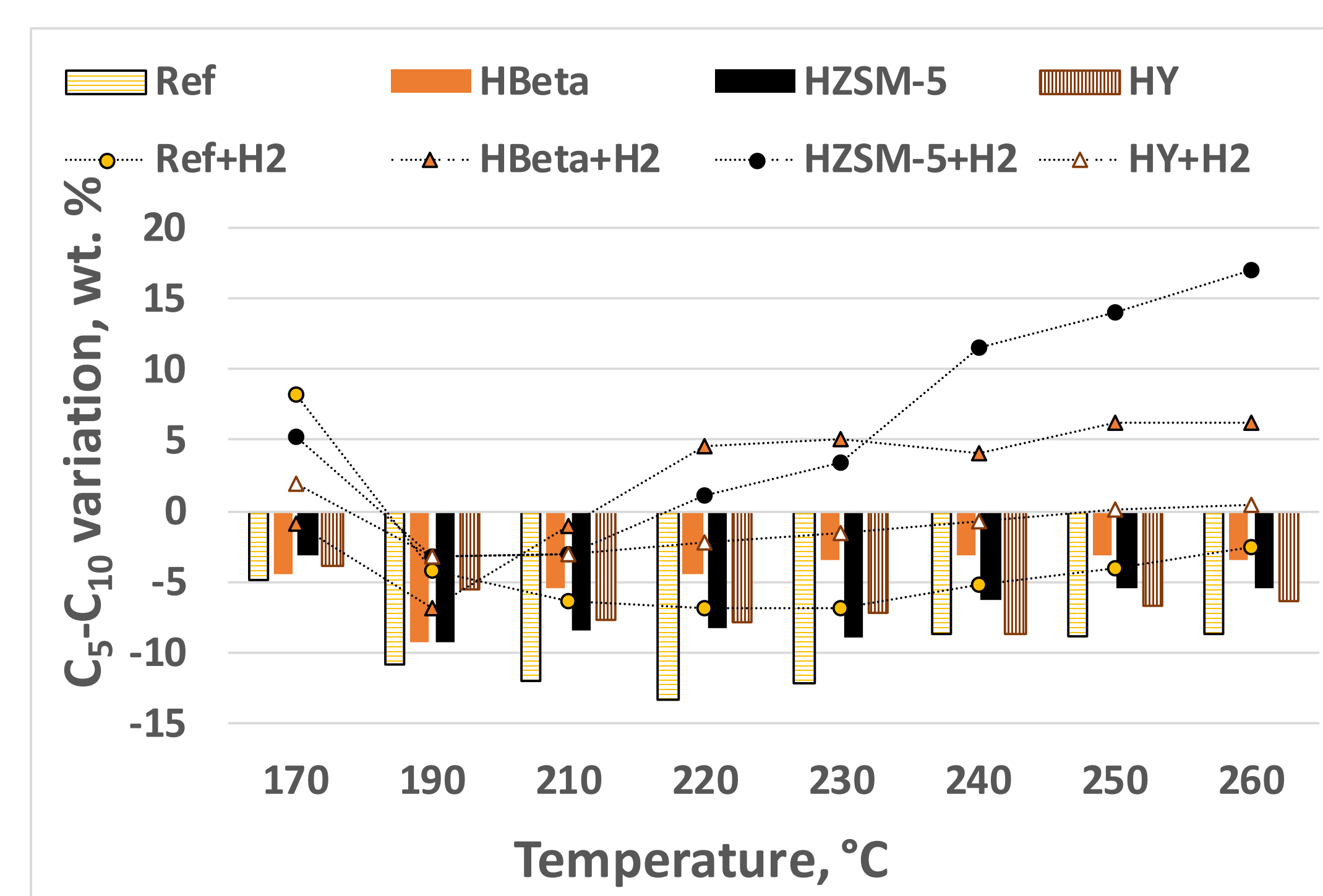
The catalysts were activated in the H₂ flow at 400°C and 0.1 MPa for 1 hr.



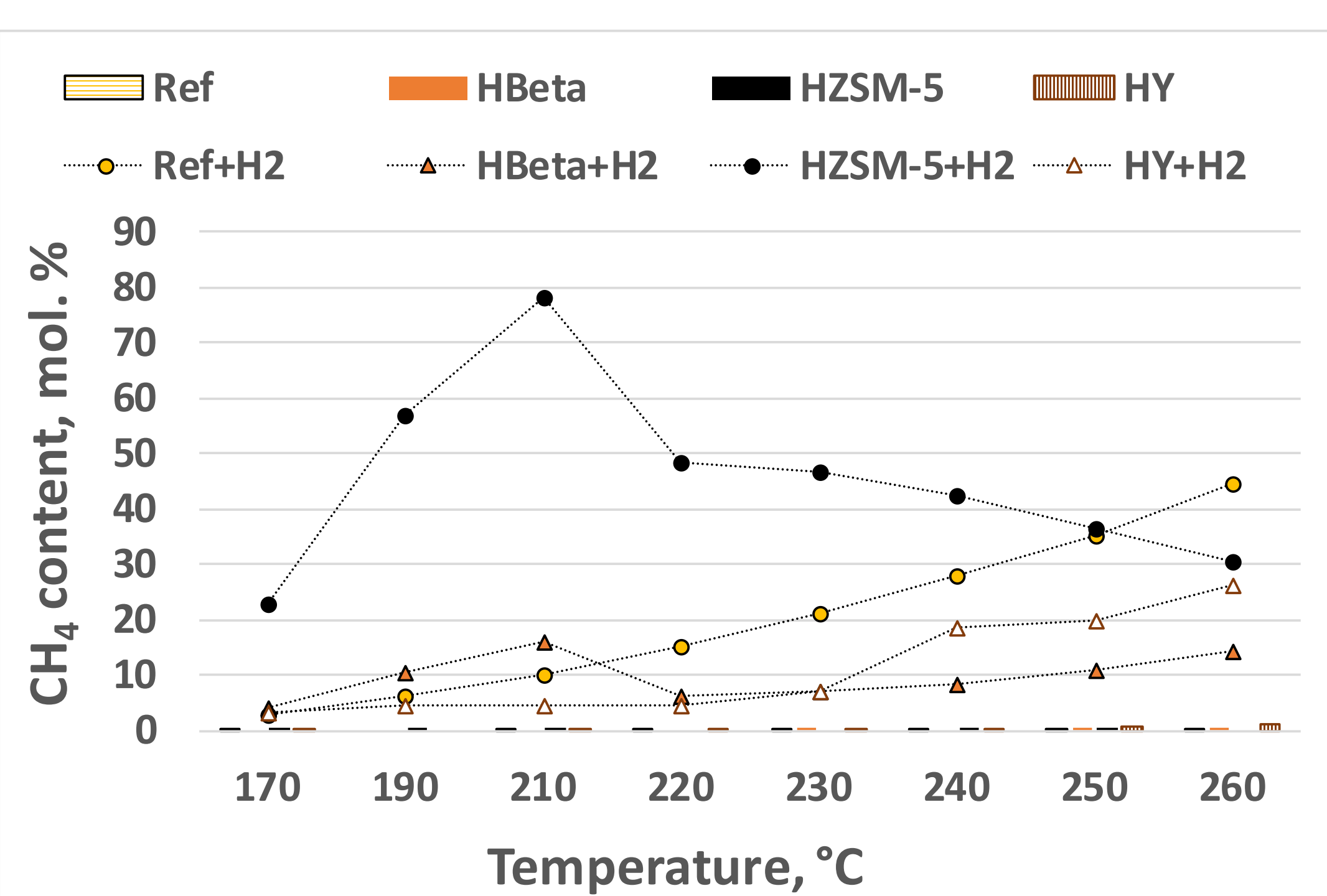
Effect of zeolite type on the conversion of liquid hydrocarbons mixture into gaseous products



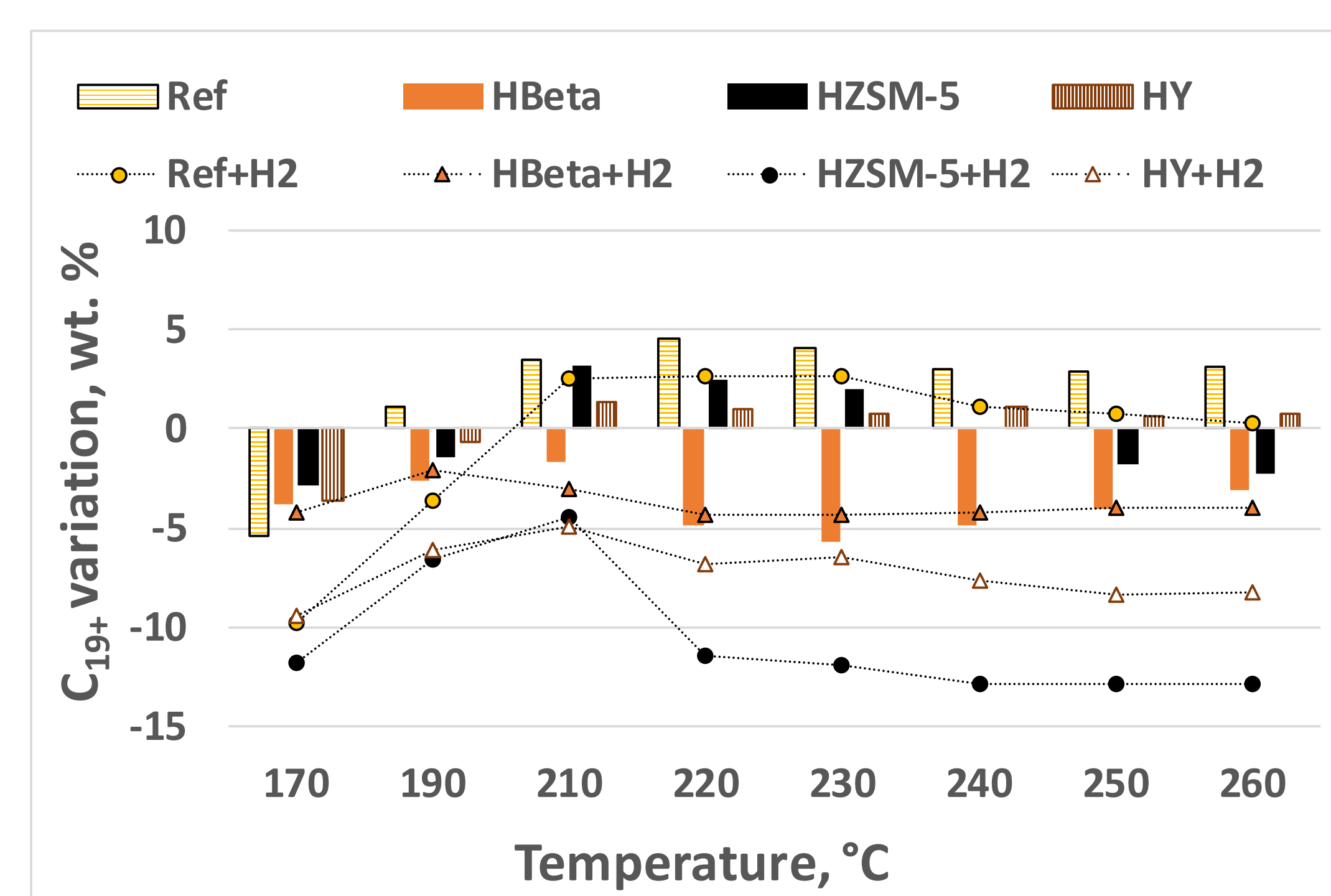
Effect of zeolite type in the catalyst on the change in content of hydrocarbon C₅–C₁₀



Effect of zeolite type in the catalyst on the CH₄ content in liquid hydrocarbons mixture



Effect of zeolite type on the change in content of hydrocarbon in content C₁₉₊



Conclusions

- Two distinct areas can be identified in temperature dependencies of reaction parameters, namely 170–210°C and 220–260°C.
 - 170–210°C: Methane and n-paraffins are the main products of transformations
 - 220–260°C: iso-paraffins and light products of cracking are the main products of transformations
- The introduction of hydrogen instead of inert as a carrier gas led to higher conversion into gaseous products with keeping however the same trend of decreasing in the range HZSM-5 > HBeta > HY ≈ Ref
- Zeolites can be instrumental in controlling composition of the products of Fischer–Tropsch synthesis produced over hybrid catalysts due to intensification of mass transfer.

References

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