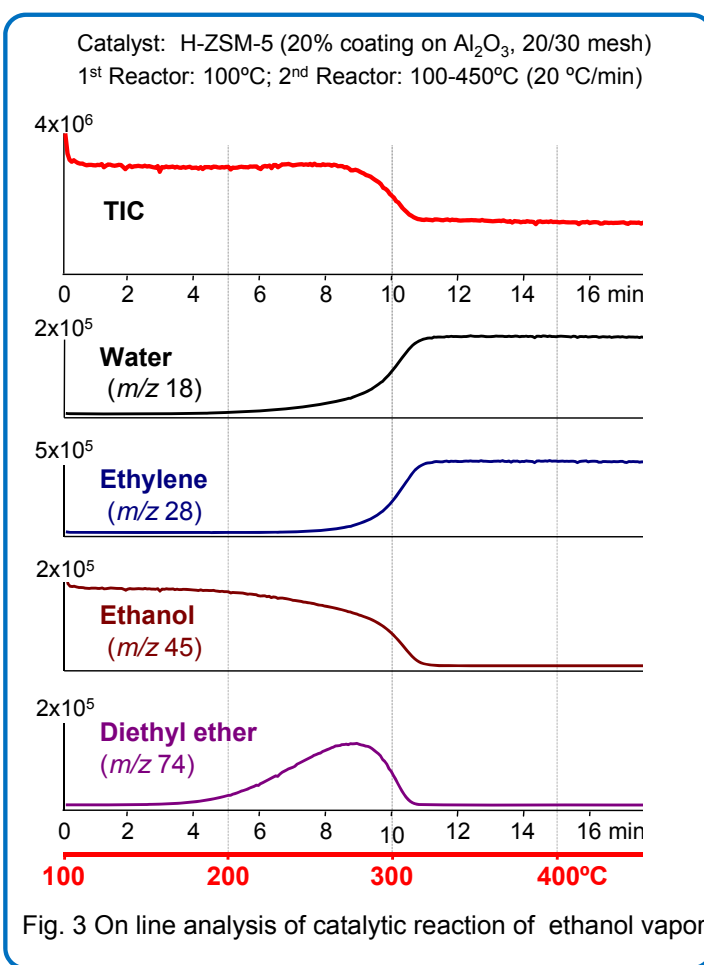
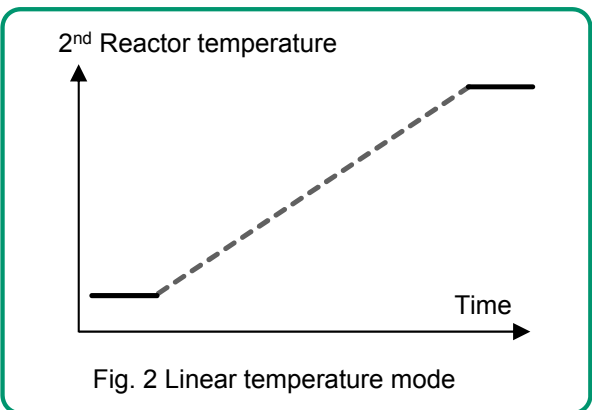
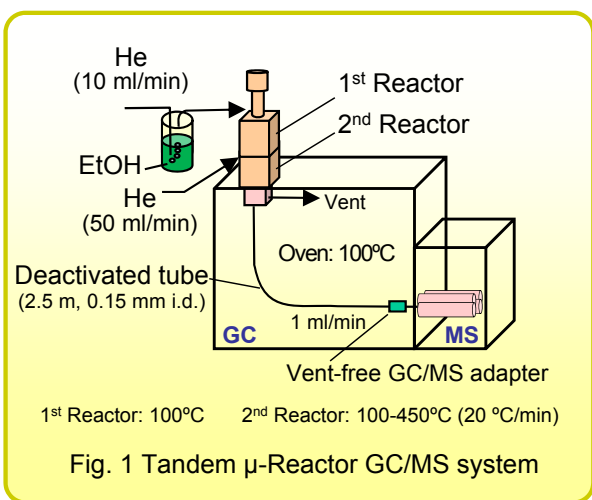


# Conversion of ethanol to ethylene using Tandem μ-Reactor GC/MS system – Part 1

**[Background]** The Tandem μ-Reactor GC/MS system designed for the rapid screening and evaluation of catalysts is described in Technical Note (RXT-001E). This technical note illustrates how the Tandem μ-Reactor GC/MS system can be used to characterize the catalytic conversion of ethanol to ethylene.

**[Experimental]** The system configuration is shown in Fig. 1. A zeolite catalyst (H-ZSM-5, 3φ x 10 mm) was packed in a quartz insert tube which was placed in the 2<sup>nd</sup> reactor. A deactivated tube connected the GC injector to the MS. Carrier gas (10 mL/min) was bubbled through ethanol. The saturated carrier gas continuously flowed through the 1<sup>st</sup> reactor. Additional helium (50 mL/min) was added as the vapors flowed from the 1<sup>st</sup> to the 2<sup>nd</sup> reactor. The temperature of the 1<sup>st</sup> reactor was held at 100°C in order to prevent condensation in the reactor. The 2<sup>nd</sup> reactor temperature was programmed from 100°C to 450°C at 20 °C/min – see Fig. 2. The reaction products were monitored, real time.

**[Results]** As the temperature of the catalyst increases, the conversion of ethanol to ethylene is observed. Fig. 3 clearly shows that the concentration of ethylene and water increases as the catalyst temperature increases beyond 200°C. Equilibrium conversion is reached when the catalyst temperature is greater than 320°C. Reaction intermediates like diethyl ether (formed during the dehydration of ethanol) are observed at temperatures between 180 and 320°C. This simple example illustrates how this system can quickly and easily be used to characterize the catalytic conversion of species A to products B. Using a mass spectrometer as a detector greatly simplifies the process of identifying conversion products.



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**Keyword :** Tandem μ-Reactor, catalyst, screening, evaluation, conversion of ethanol to ethylene

**Applications :** Catalyst screening and evaluation

**Related technical notes :** RXT-001E, RXA-002E

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