UST UNIVERSITY OF SCIENCE & TECHNOLOGY

KRICT Korea Research Institute of Chemical Technology

# KTO

Seminar- Fall 2023


- Department: Hydrogen & C1 Gas Research Center
- Major: Advanced Materials and Chemical Technology
- MS student: Khujamuratov Temur

# Contents

- The problems, solutions and purpose of KTO analysis
- Process
- Analysis methods
- Chemical analysis
- Data analysis

# Main problem of car manufacturing companies

- There are many emission regulations that restrict to release waste to environment and it is getting stricter year by year. So car manufacturers are doing research that invent an fuel not to harm environment.

- Emission regulations: smoke (SN), hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NOx)

# Solutions

- We can see several car brands that not harm environment at all. They use Hydrogen Fuel. It release water only.

$$2\ H_2 + O_2 = 2\ H_2O + \text{energy}$$

Disadvantages: Hydrogen fuel is expensive so everyone can afford it.


# What is KTO?

- However there is an alternative solution that is cheaper and also least harmful than daily use fuels. Yes there is.

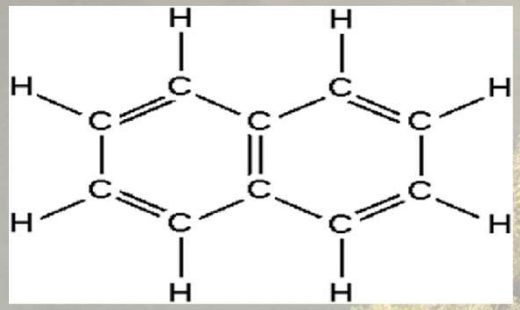
- They are propylene and ethylene gases.
- They are both OLEFINS

- What we do? We crack big kerosene molecules into small gas molecules so we get more internal combustion fuel (Gas).

- KTO means Kerosene-To-Olefins

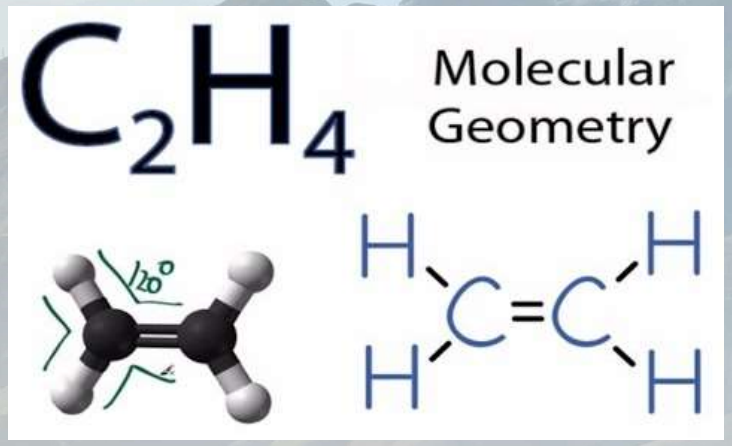
# Purpose of the analysis

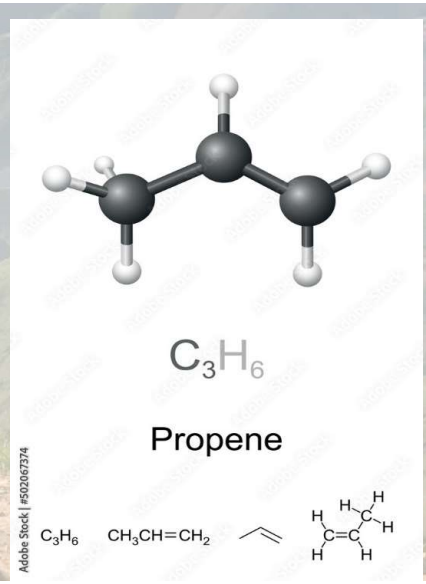
- We are trying to find the catalyst that has high selectivity for C2H4 and C3H6



Catalyst

580 Celsius



# Process

- There are 2 type of analysis in our project
    1. Chemical Analysis
    2. Data analysis (we turn files into graphs)

Graphs can show us how is the project going. We can stop the project if it has no future.


Chemical Analysis

# Chemical Process

- We use several chemical analysis methods. GC and Pona show the substances in the sample we collect during the experiment (Gases and liquids).
- Gas is analyzed by GC (Gas Chromatography System, Name: YL 6100GC Model: GC 6000 Series).

Liquids are analyzed by PONA.

# What is GC?

- Gas Chromatography (GC)

While we are collecting liquid samples manually, GC analyze gases that burn in the experiment.

GC analyzes the gases for 54 mins and rests for 6 mins

# How GC work?

- It is not too difficult to understand

- As you know every organic material release some amount of energy when it burns. Only thing GC checks is the energy, simply temperature.

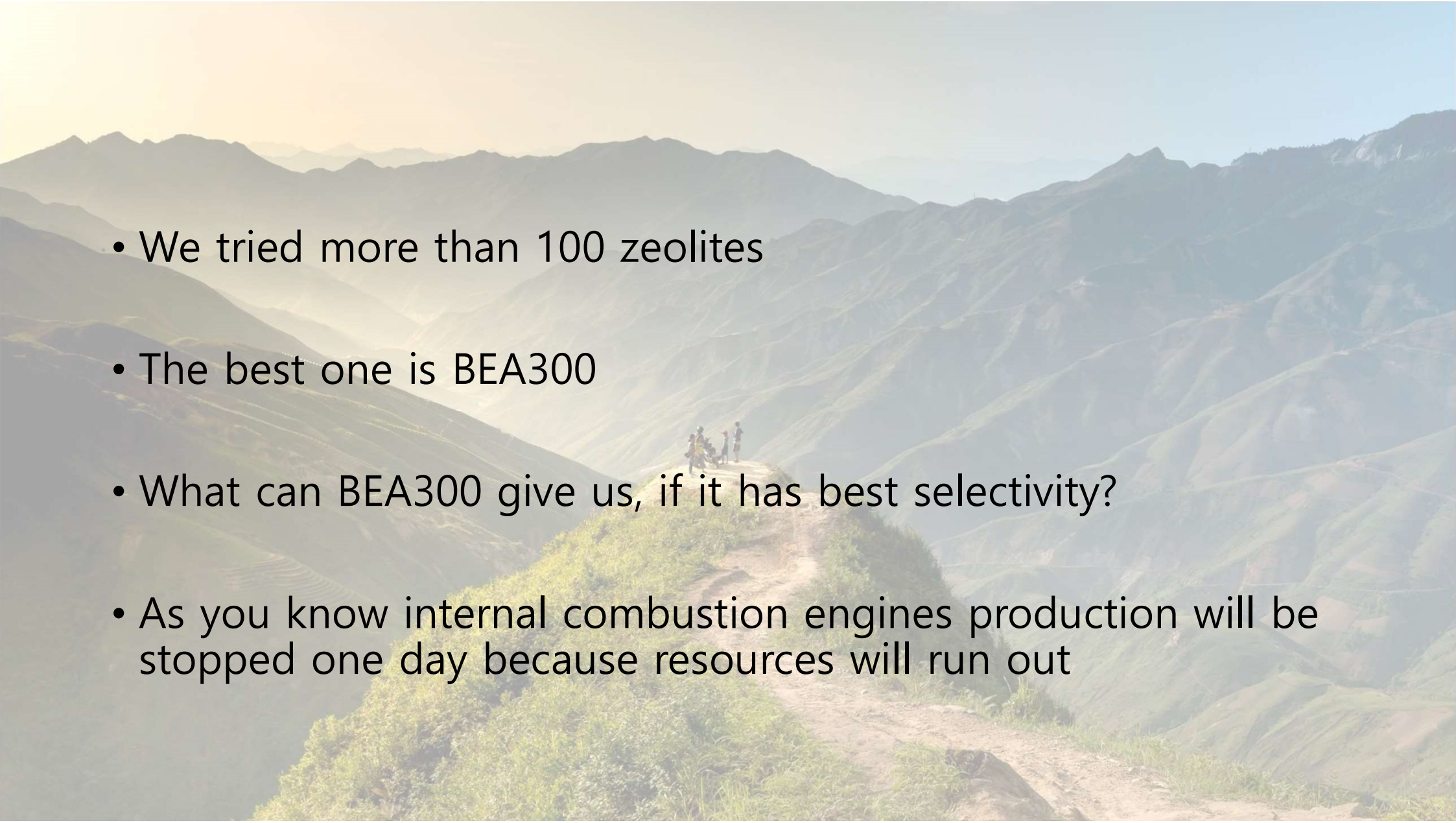
- Meaning: Big gases release more energy, Small gases less

  (big small words are used for their mass.

  Buten's mass is 58, Ethylene's is 28)

# How Pona Works?

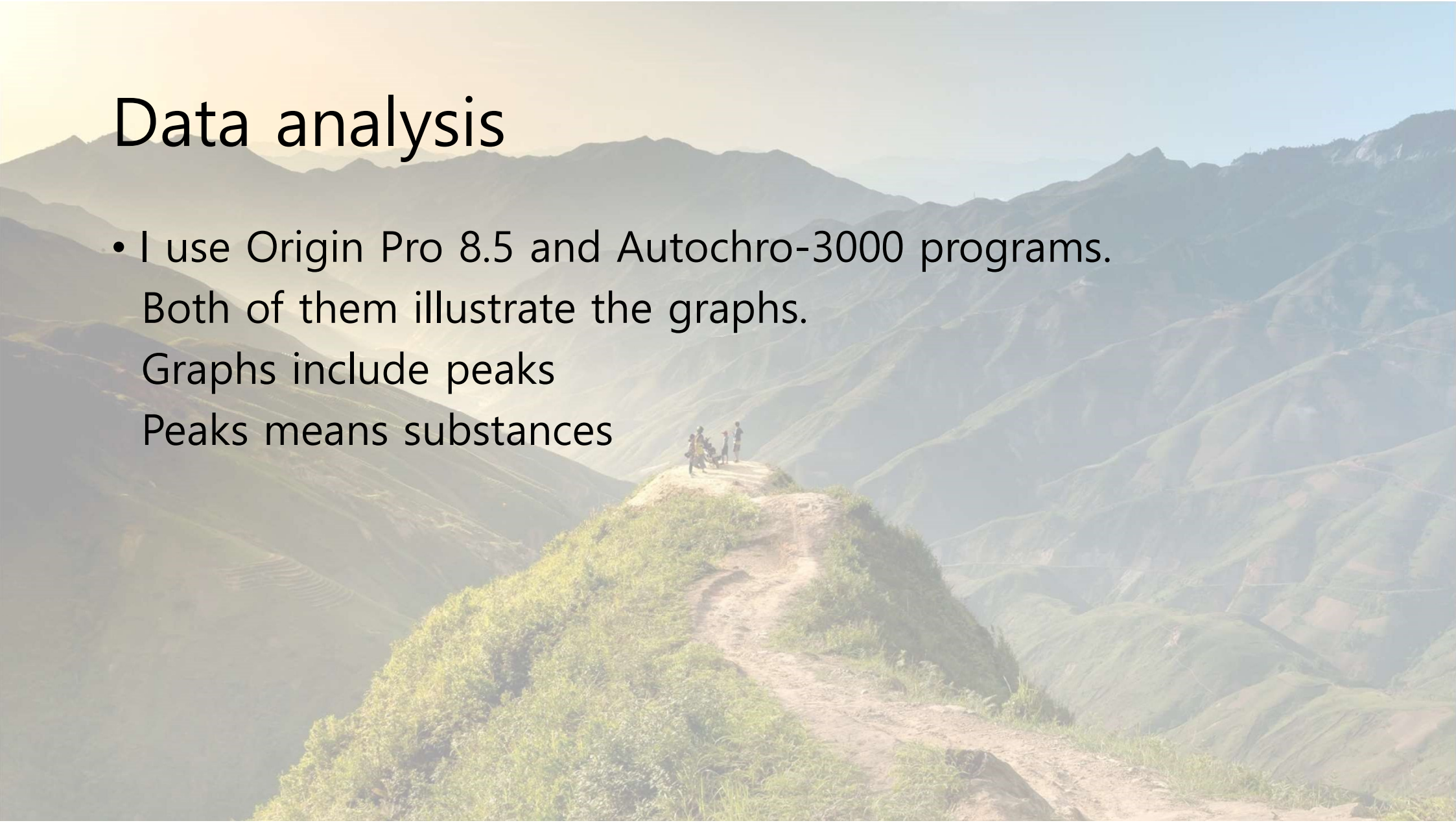
- Pona almost same with GC. However it checks liquids by heating.



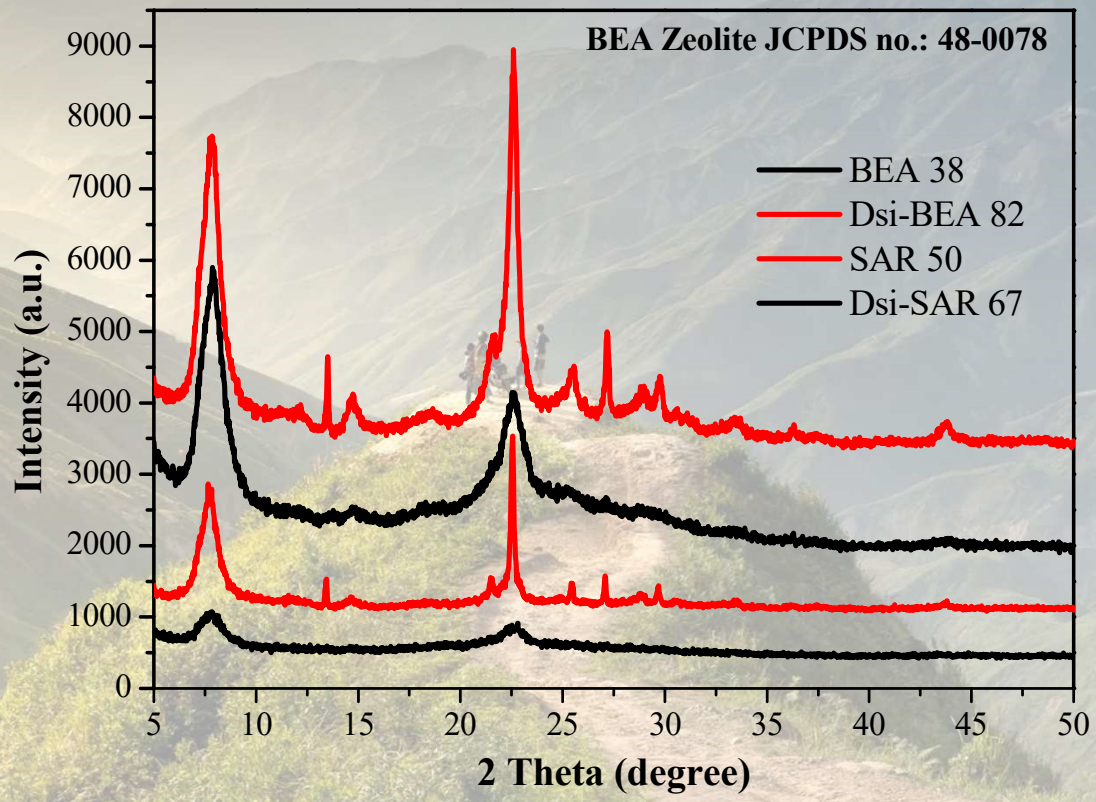
- We tried more than 100 zeolites
- The best one is BEA300
- What can BEA300 give us, if it has best selectivity?
- As you know internal combustion engines production will be stopped one day because resources will run out

# Data analysis

- I use Origin Pro 8.5 and Autochro-3000 programs.
  Both of them illustrate the graphs.
  Graphs include peaks
  Peaks means substances



- After we analyze the samples, we get date. Date can give us graphs that can shows the concentration of gases and liquids




Autochro-3000

# The biggest disadvantages of the software

**Problems**

- System is difficult to understand and make an operation.
- It has more than 10 manual steps that connected each other. They should be step by step.
- Files should be collected and need to be converted.

**Solutions**

- GC, Autochro-3000 and Pona should be combined because their equipment, software and hardware are almost identical.