VII CONGRESO INTERNACIONAL DE DIDÁCTICA DE LA QUÍMICA

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LIGHT HYDROCARBONS PROFILE CHARACTERIZATION (C_1 - C_7) IN GASOLINE SAMPLES BY GAS CHROMATOGRAPHY-FLAME IONIZATION DETECTION (GC-FID)

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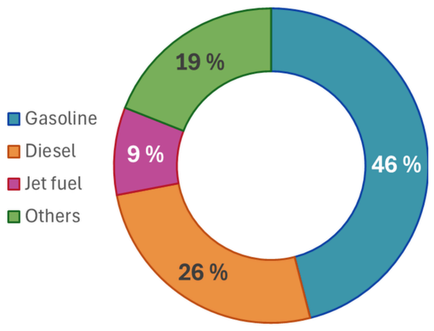
INTRODUCTION

Oil fractioning

Hydrocarbons mixture from C_5 - C_{12}; additives (EtOH, ETBE, MTBE, TAME); impurities from other oil fractions.



81 % from crude oil is used for fuels production.

Gasoline specifications (NOM-016-CRE-2016):

- Vapor pressure: 7.8 - 11.5 psi.
- Distillation temperatures: 60 - 225 °C.
- RON + MON: regular 87, premium 91.

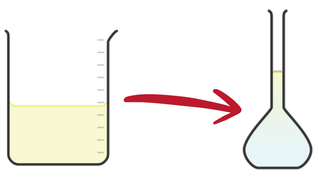
AIM

Characterize the light hydrocarbons profile (**C_1 - C_7**) in two types of Mexican gasoline (regular and premium) using gas chromatography-flame ionization detection (GC-FID).

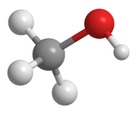
EXPERIMENTAL

9 gas stations

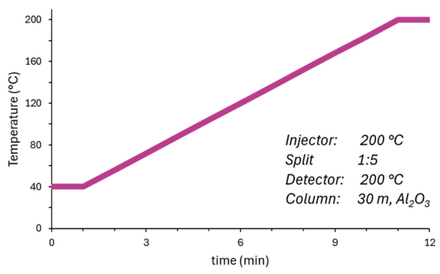
2 types of gasoline



Dilute to **5 %** in methanol.



Analyze gasoline vapor by GC.

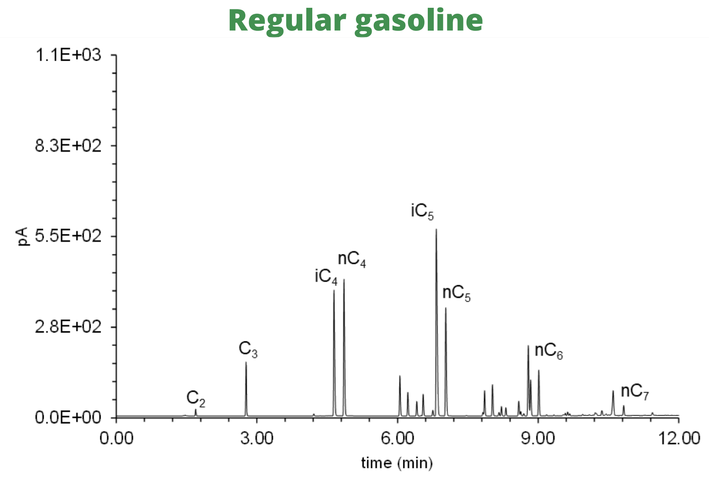


Quantify by area normalization (**A %**).

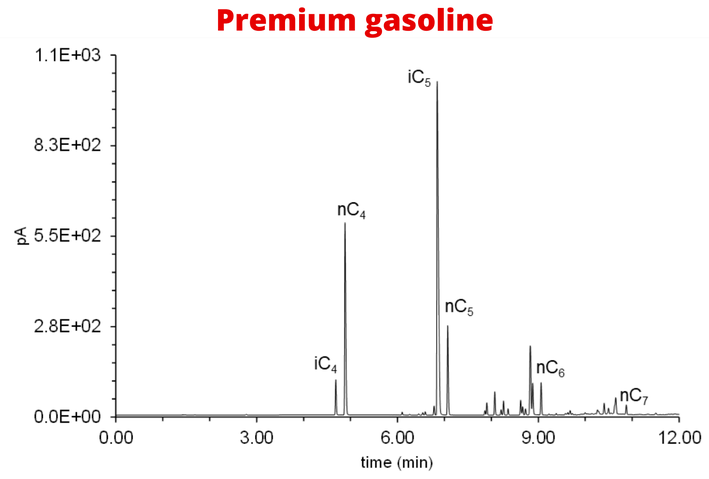
RESULTS

Identification of the **light hydrocarbons profile:** metane (C_1), etane (C_2), propane (C_3), isobutane (iC_4), n-butane (nC_4), isopentane (iC_5), n-pentane (nC_5), n-hexane (nC_6), n-heptane (nC_7).

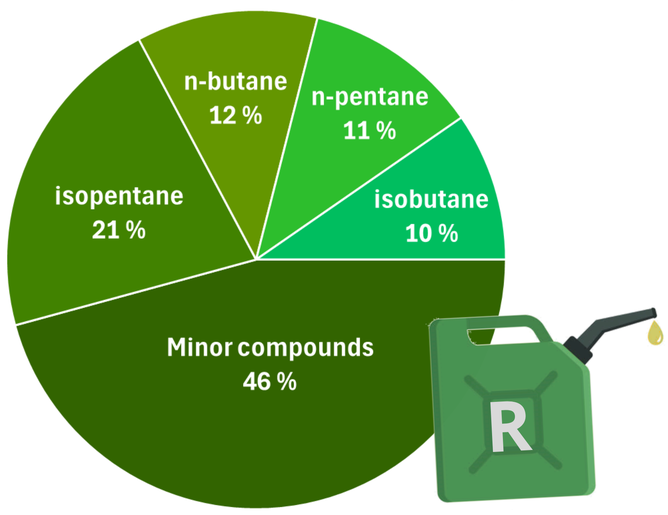
Regular gasoline

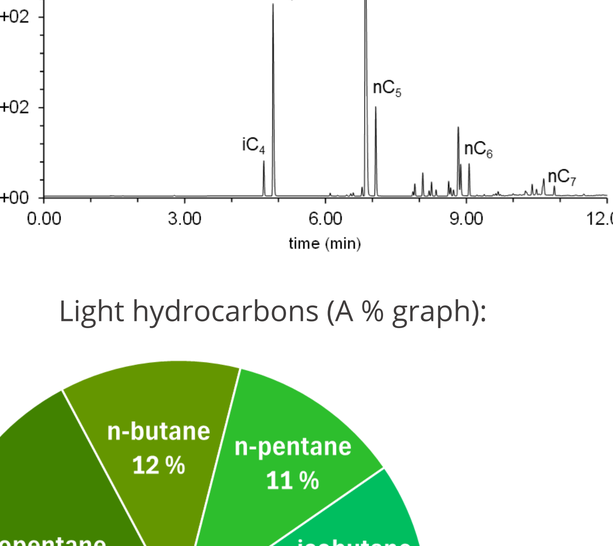


Premium gasoline



Light hydrocarbons (A % graph):



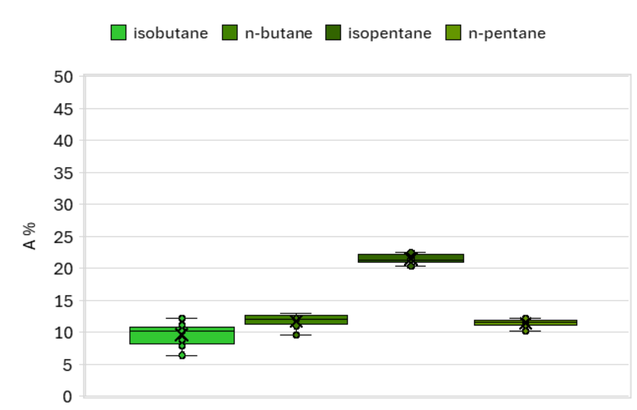


Analytical method showed high precision and accuracy. Repeatability and reproducibility was evaluated; low relative standard deviation were calculated (RSD from 1 - 11%).

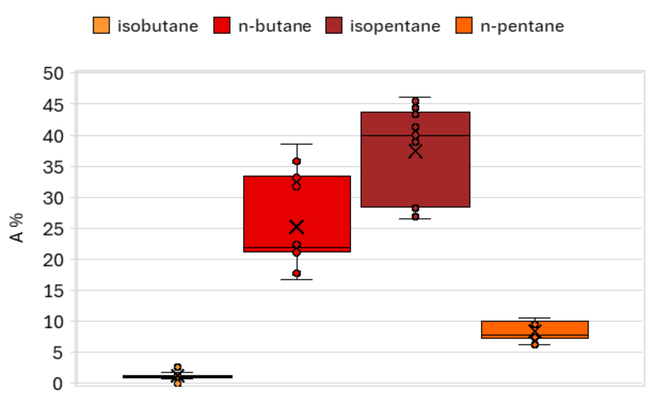
DATA ANALYSIS

Box-Plot comparison of the major identified hydrocarbons:

Regular gasoline



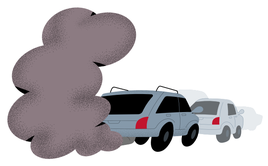
Premium gasoline



Take Aways

Fast and simple method; **non specialized GC.**

For **teaching** at chemistry labs. **Theorical and experimental** chemistry and physicochemical **approches**.



VOCs evaporative emissions. Light hydricarbons variability in **fuel samples**.

CONCLUSIONS

The light hydrocarbons profile in two types of Mexican gasoline was characterized by GC-FID. This new application **increases the scope** of the ASTM D2163-23$^{\varepsilon 1}$ recomendation and allows the the hydrocarbons profile characterization in fuels other than liquefied petroleum gases (LPG). This analytical method can be applied for academic or industrial purposes.

REFERENCES

1. NOM-016-CRE-2016, Especificaciones de calidad de los petrolíferos.
2. ASTM D2163-23$^{\varepsilon 1}$ Standard Test Method for Determination of Hydrocarbons in Liquefied Petroleum (LP) Gases and Propane/propene Mixtures by Gas Chromatography.
3. Determinación del perfil de hidrocarburos ligeros (C1-C7) en muestras de gasolina por cromatografía de gases-ionización de flama. Livro de resumos do XXIX Encontro Luso-Galego de Química, Braga, Portugal, 2025.