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# Efficacy of ozonation as a method of decontamination of hydrocarbons in seawater

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## INTRODUCTION & AIM

- The increase in maritime traffic has caused an alarming oil pollution. Illegal dumping of bilge water from ships is one of the main sources of this type of pollution in seas and oceans, dumping 16,000 metric tonnes per year[1].
- The main hydrocarbons present in sea water are 16 PAHs named by the EPA as priority pollutants and *n*-alkanes from diesel[2]. They damage ecosystems and human health, often being carcinogenic, teratogenic and mutagenic[3].

The aim of this work was to evaluate the effectiveness of ozonation as a decontamination treatment of seawater with a high concentration of 16 PAHs and diesel.

## METHOD

### Sample preparation

Artificial seawater + 16 PAHs standard → Samples 50 µg/L

Artificial seawater + Diesel standard → Samples 500 µg/L

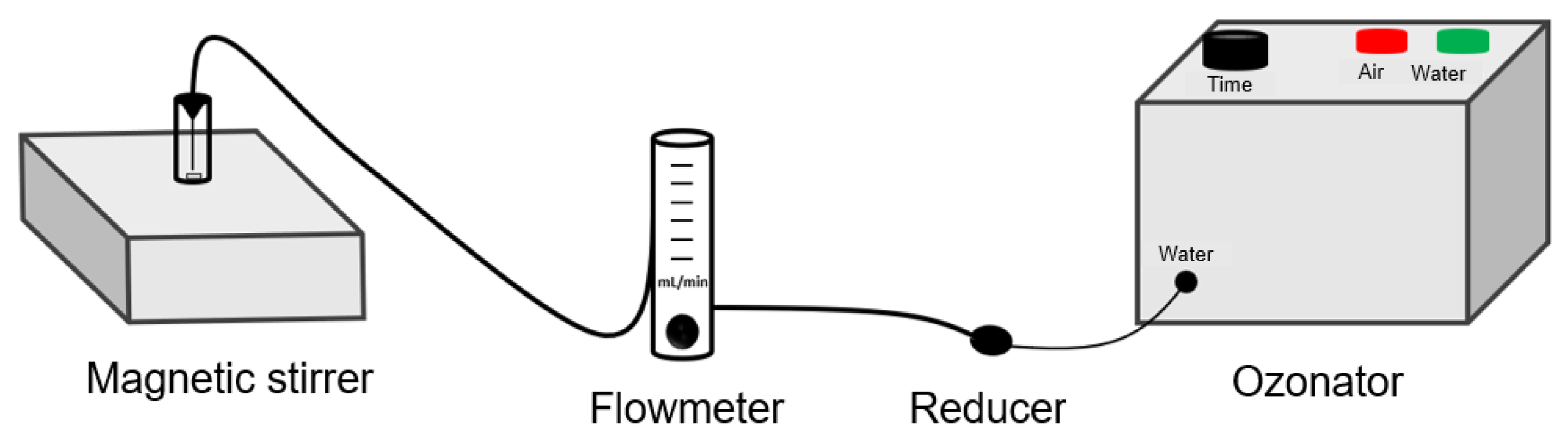
Sample stirring: 220 rpm, 24 h, 25ºC

### Sample analysis

Extraction of hydrocarbons by DI-SPME → Analysis by GC-MS[4]

Extraction conditions:
45ºC, 600 rpm, 60 min, PDMS fiber (100 µm)

### Sample ozonation




Ozonation times:
PAHs → 15, 30, 60, 120, 720 min
Diésel → 15, 30, 60, 720, 1440, 2880 min

Stirring 300 rpm

Flow 50 mL ozone/min

## RESULTS & DISCUSSION

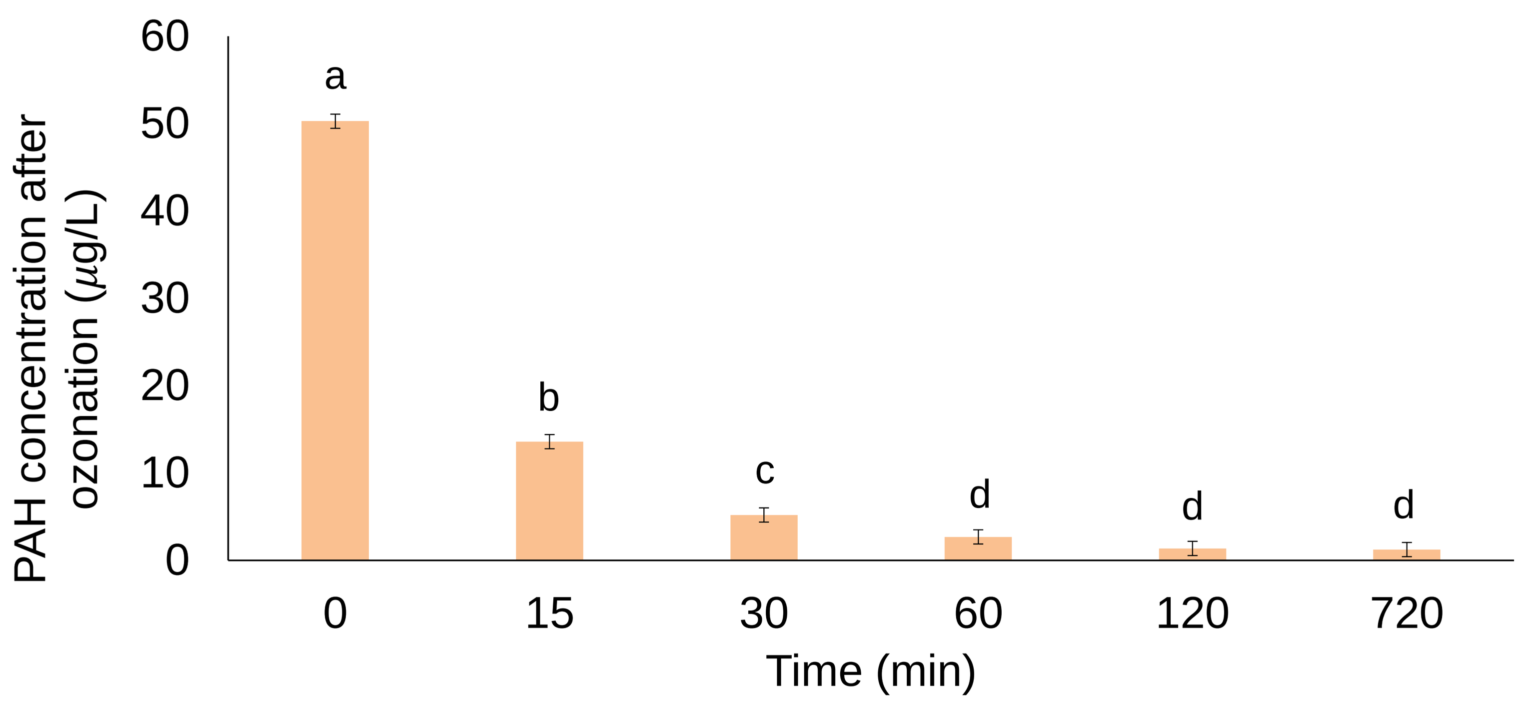



**Fig 1.** Variation of total PAH concentration (µg/L) after ozonation vs. ozonation time. Means with the same letter indicate that there are no significant differences in the Duncan test (p ≤0.05). The bars show the standard deviation of the mean (n=3).

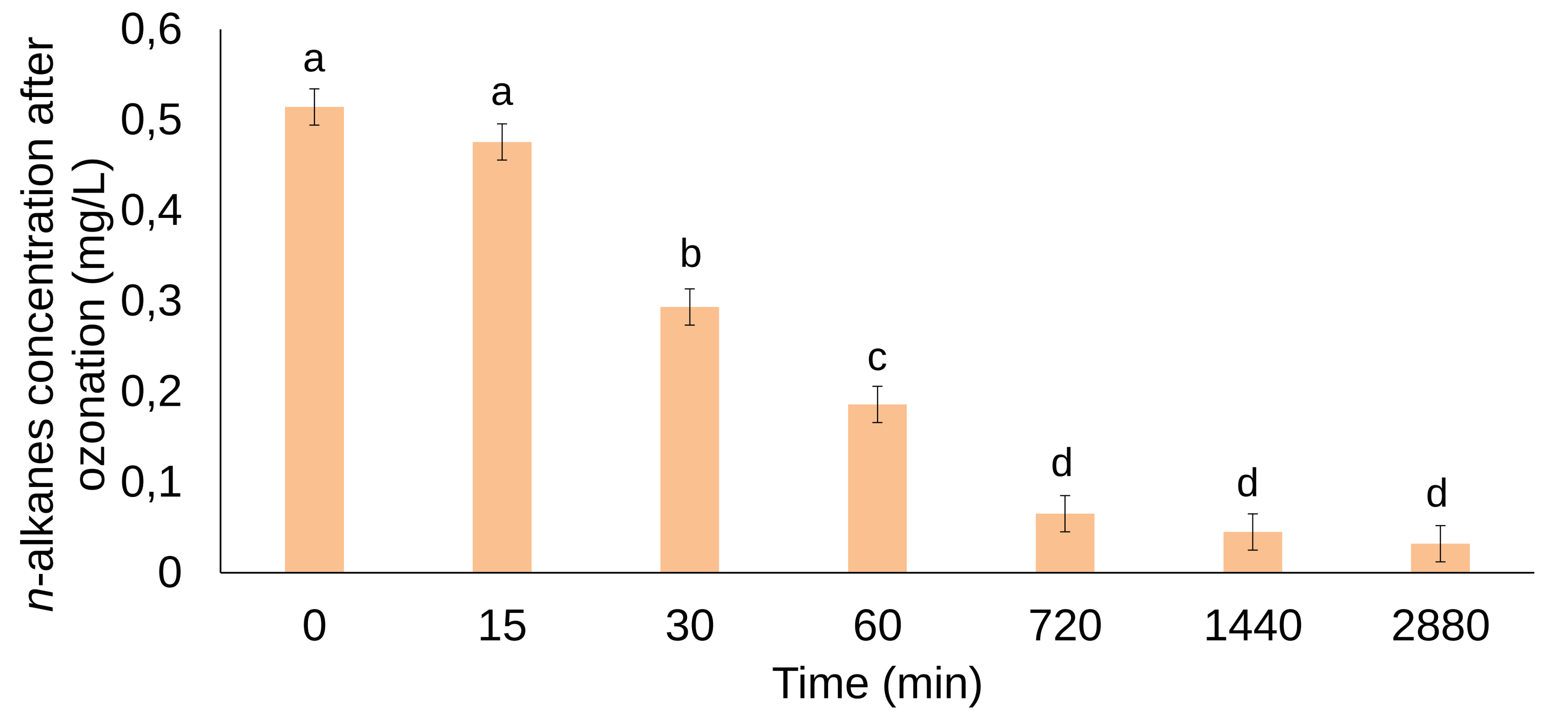



**Fig 2.** Variation of total *n*-alkane concentration (mg/L) after ozonation vs. ozonation time. Means with the same letter indicate that there are no significant differences in the Duncan test (p ≤0.05). The bars show the standard deviation of the mean (n=3).

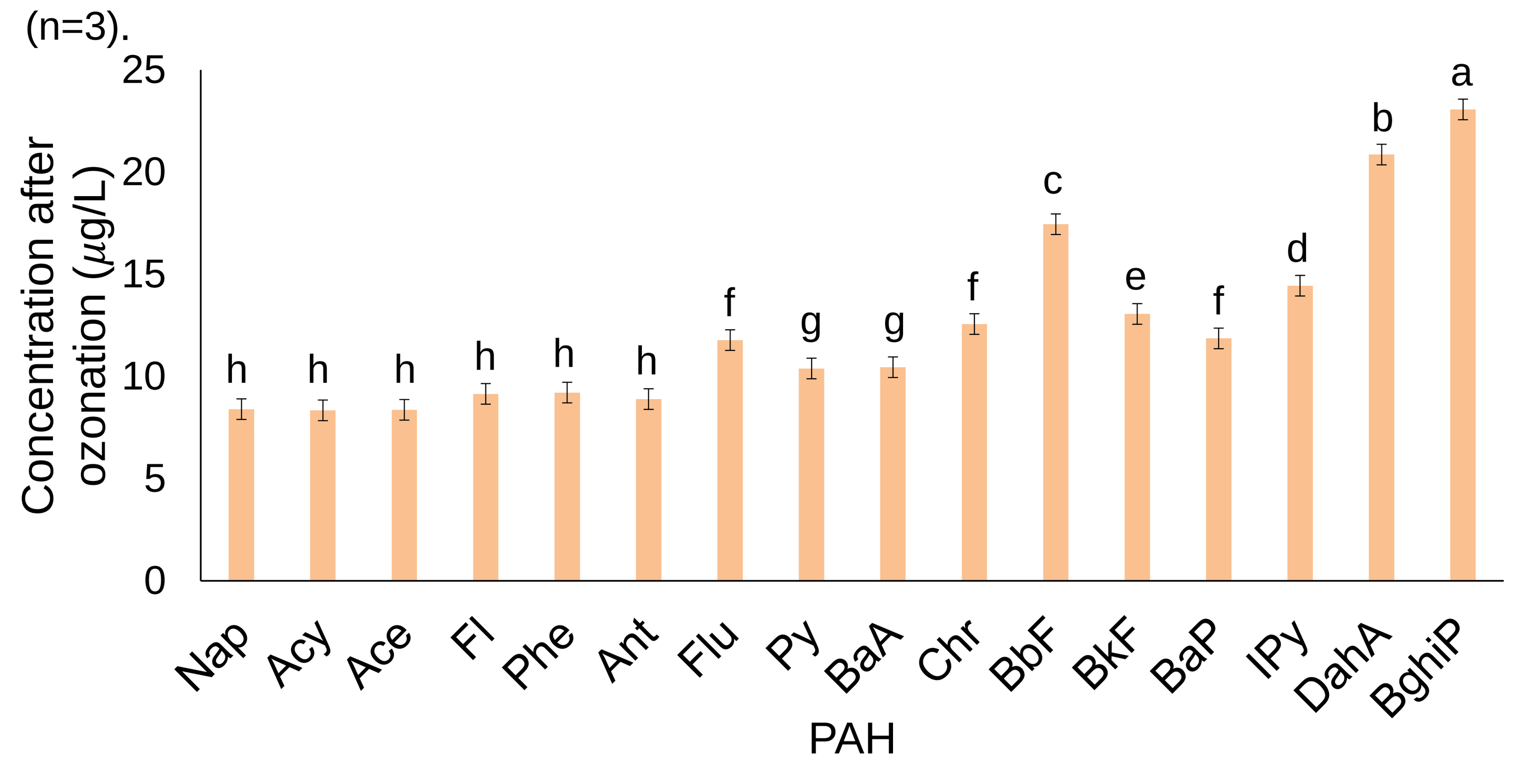



**Fig 3.** Concentration after ozonation of each PAH (µg/L) after ozonation. Means with the same letter indicate that there are no significant differences in the Duncan test (p ≤0.05). The bars show the standard deviation of the mean (n=3).

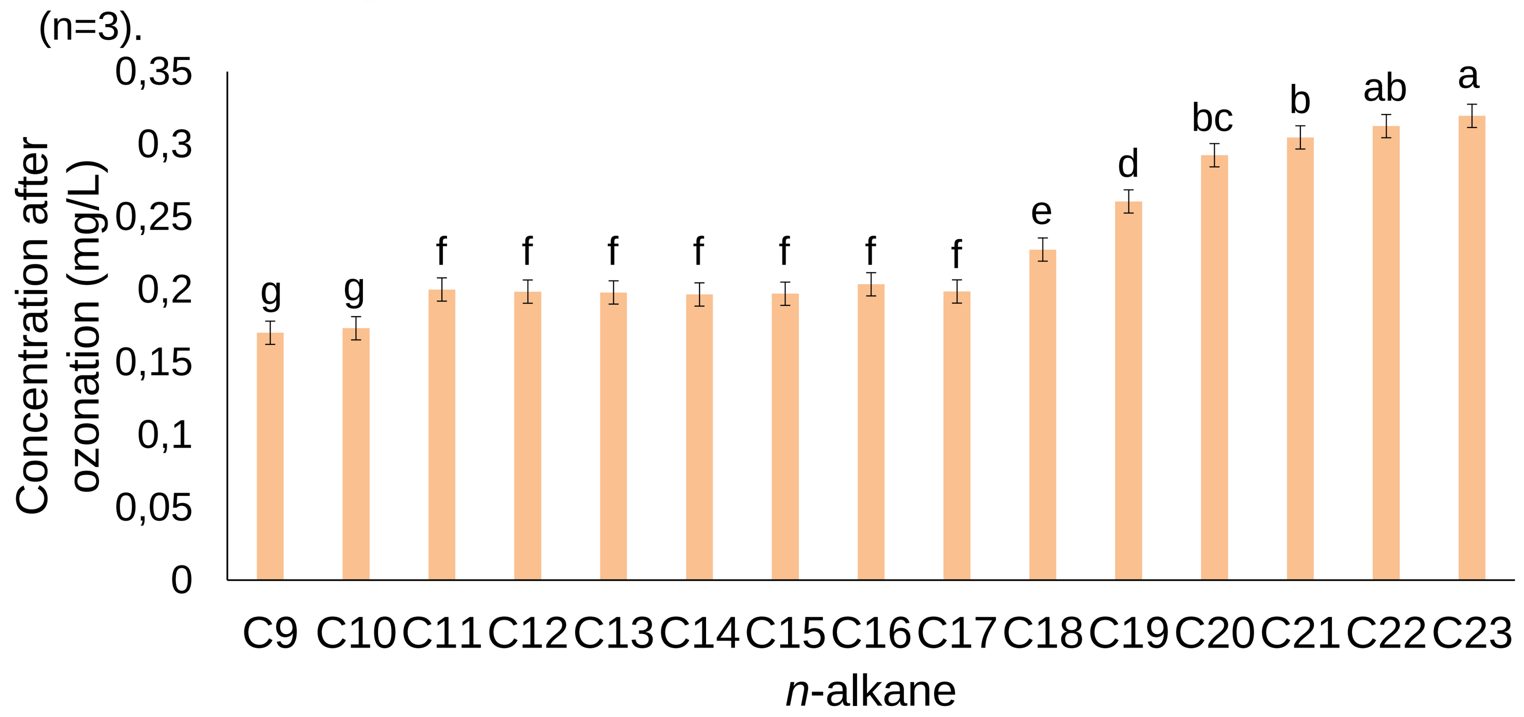



**Fig 4.** Concentration after ozonation of each *n*-alkane (mg/L) after ozonation. Means with the same letter indicate that there are no significant differences in the Duncan test (p ≤0.05). The bars show the standard deviation of the mean (n=3).

## CONCLUSION

Ozonation reduced PAHs and *n*-alkanes in seawater, with higher efficiency for PAHs (94.6% in 60 minutes) compared to *n*-alkanes (87.3% in 720 minutes). It was also observed that the oxidation efficiency decreased as the molecular weight of PAHs and *n*-alkanes increased.

## REFERENCES

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