Obtaining carbon nanoparticles from biomass and its application in the preparation of nanofluids for combustion in diesel engines

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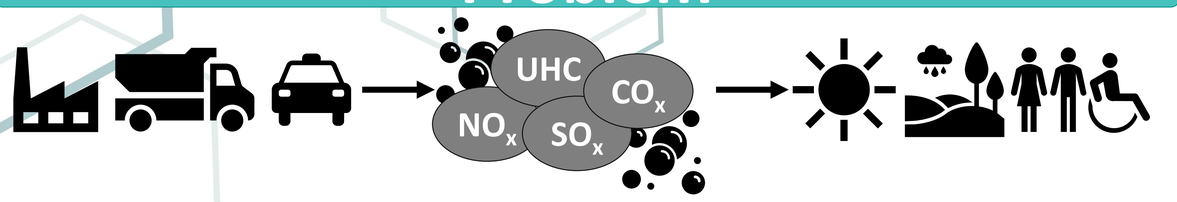
INTRODUCTION

Energy is a key factor in the economic and social development of countries, but also a challenging issue. Internal combustion engines are widely utilized in heavy and light vehicles, being the main users of fossil fuels.

Problem



Solution

The improvement of fuel properties for diesel emission reductions as well as for optimization of combustion-related factors, without worsening efficiency.

Cloud Point | Cetane Index | Kinematic Viscosity | Smoke Point | Flash Point | Heating Value

Low Emissions

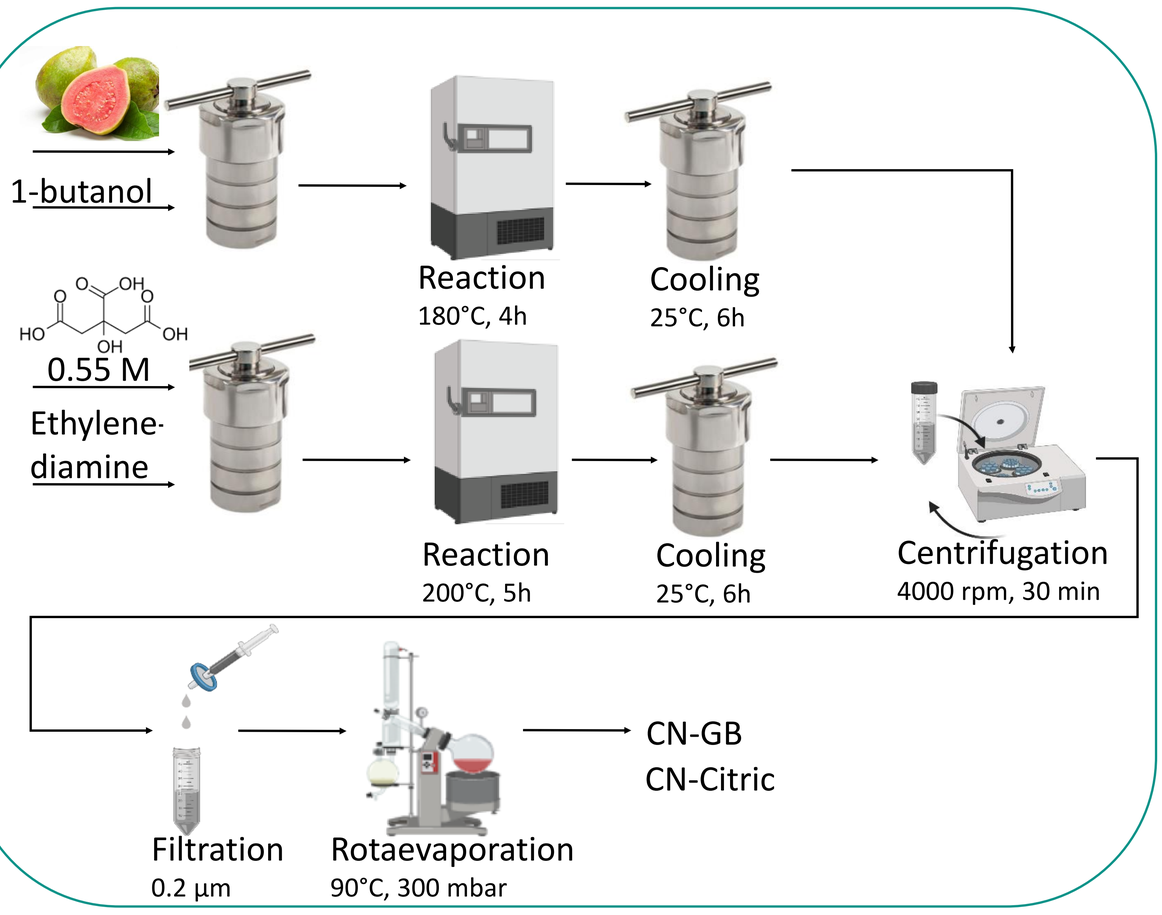
No change in engine structure

Aim

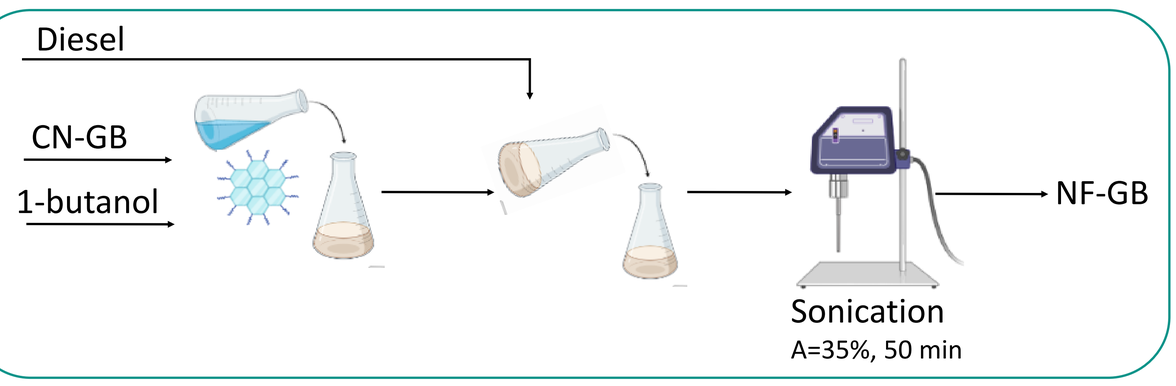
To study the effect on diesel properties and combustion of the addition of carbon nanoparticles (CNs) a liquid oxygenated agent (1-butanol) to diesel fuel.

METHODOLOGY

CNs Preparation



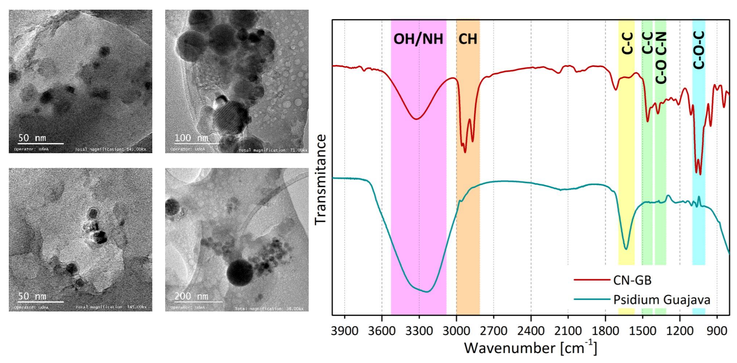
Nanofluid Preparation



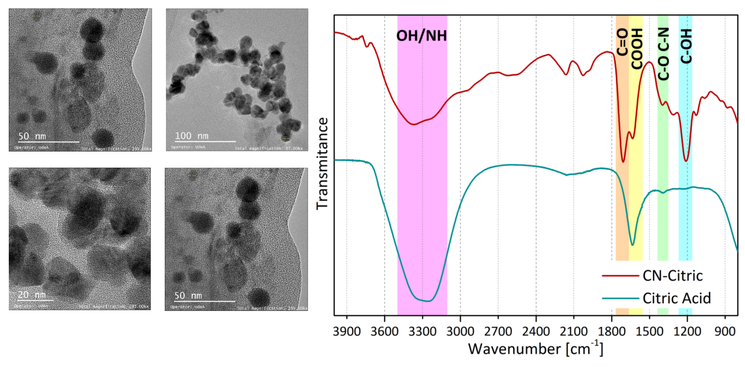
RESULTS

Optical and Compositional

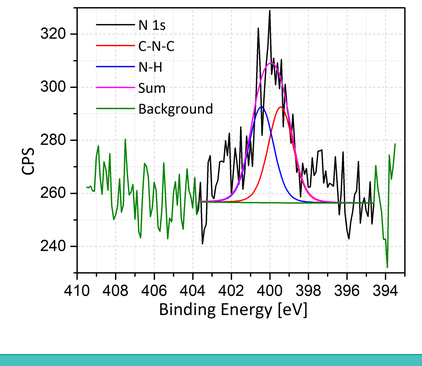
CN-GB

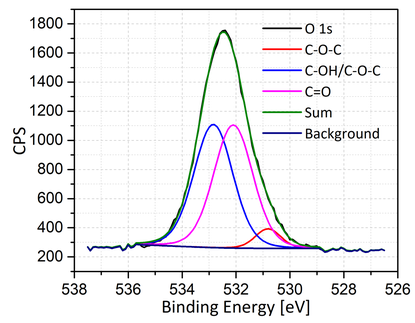


CN-Citric



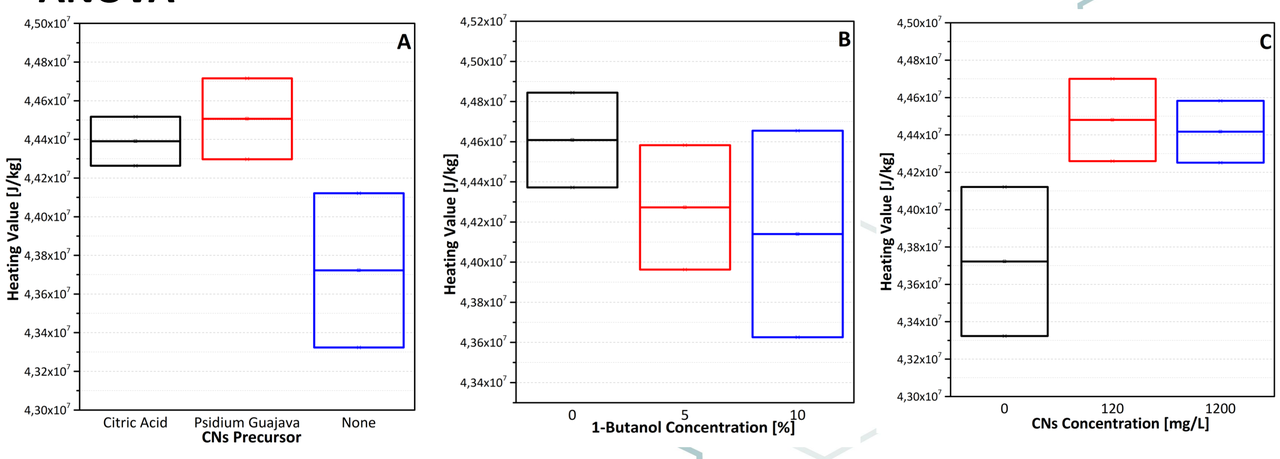
XPS (CN-GB)





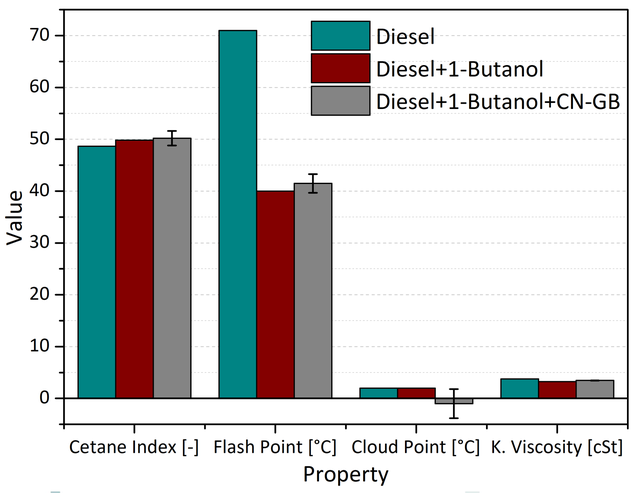
Nanofluid

ANOVA



Property comparison

CN	Diesel [%]	1-Butanol [%]	CN [mg/L]	Thermal Conductivity [W/(m*K)]	Error [%]	Smoke Point [mm]
--	95	5	--	--	--	11.8
--	90	10	--	--	--	11.8
GB	95	5	120	0.143	0.0065	18.4
GB	90	10	1200	0.142	0.0048	19.3
Citric	90	10	120	0.159	0.005	20.2
Citric	95	5	1200	0.157	0.0154	18.4



REMARKS

The cetane number, cloud point [°C] and kinematic viscosity [cSt] did not show significant changes between samples, while the flash point [°C] and smoke point showed differences depending on the nanofluid composition.

Statistically analyzing the calorific value of commercial diesel and nanofluids, the biomass and CQD concentration factors showed unequal means.

Further studies in an engine are suggested to confirm that CNs are a suitable strategy to reduce combustion emissions

Acknowledgments

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