



Boosting the change into circular bioeconomy

Summary

IRODDI (Innovative Refining Process for Valorization of Vegetable Oil Deodorizer Distillates) project aims to develop new biobased products using the **free fatty acids (FFAs)** contained in the residual side streams of the refining process of oils and fats, called deodorization distillates (DODs). It also aims to develop innovative technologies for isolation of **valuable minor compounds** present in the DODs by applying mild operational conditions.

DOD	PH-O	PH-PO	CH-PO	CH-SF	PH-P
TG, %	0.5	1.3	14.0	3.5	36.8
DG, %	1.5	3.8	2.1	6.9	22.3
MG, %	16.7	7.2	6.7	6.4	3.3
FFA+unsap	81.3	87.7	77.2	83.2	36.0
Acid Value (mgKOH/g)	160.67	129.78	10.62	135.91	72.70
Squalene, %	8.11	1.80	1.38	0.81	1.06

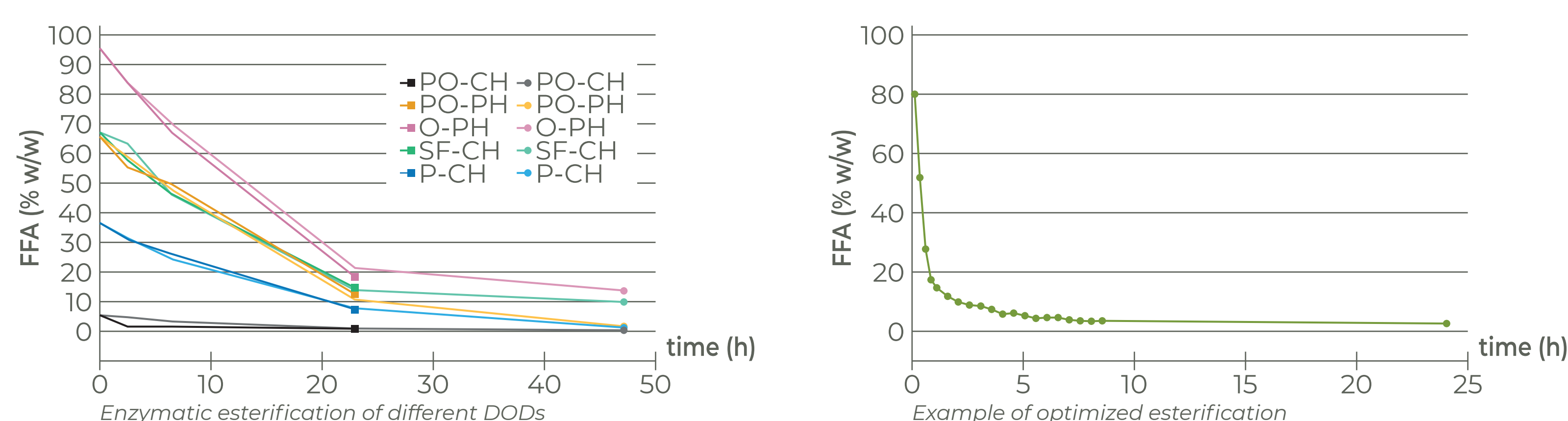
Composition of some DODs: PH= physical refining, CH=chemical refining, O=Olive oil, PO= Olive pomace oil, SF= Sunflower oil, P=Palm oil

The deodorization process is the last step in the refining process of oils and fats, where compounds that are responsible for the odor, color, and unacceptable flavor in oil are removed. Valuable compounds such as tocopherols, squalene, FFA mono-, di- and tri-glycerides are found in the DODs.



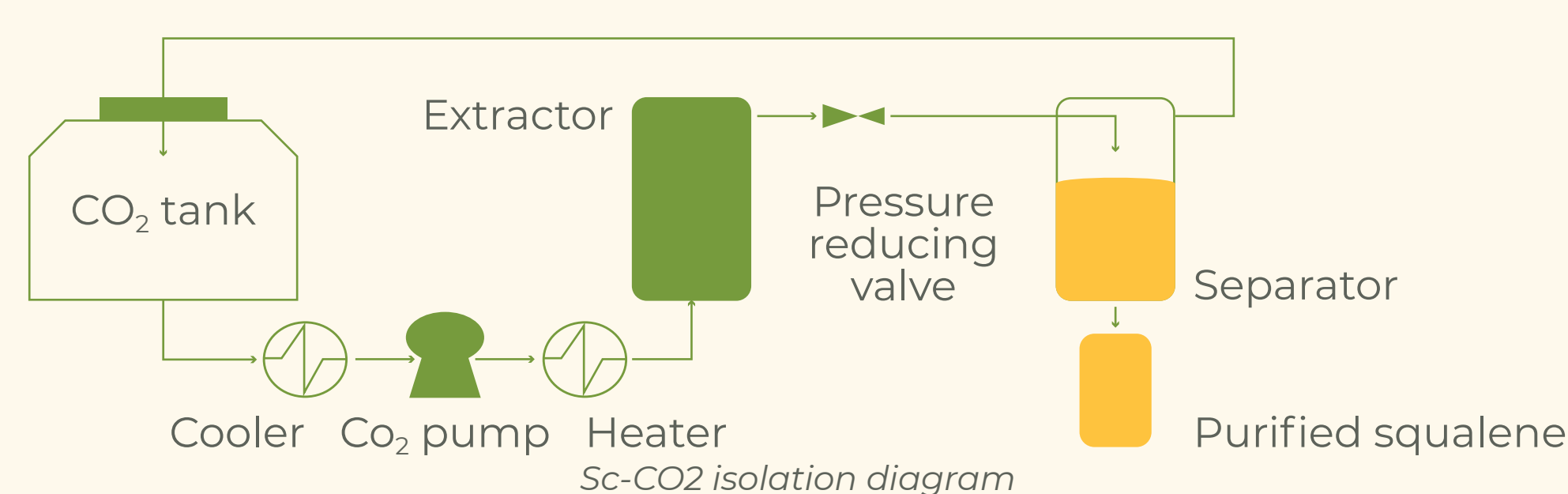
Biolubricants

By applying **enzymatic esterification** reactions to DODs, biodegradable base base-oils that can be directly used in the formulation of biolubricants are obtained.



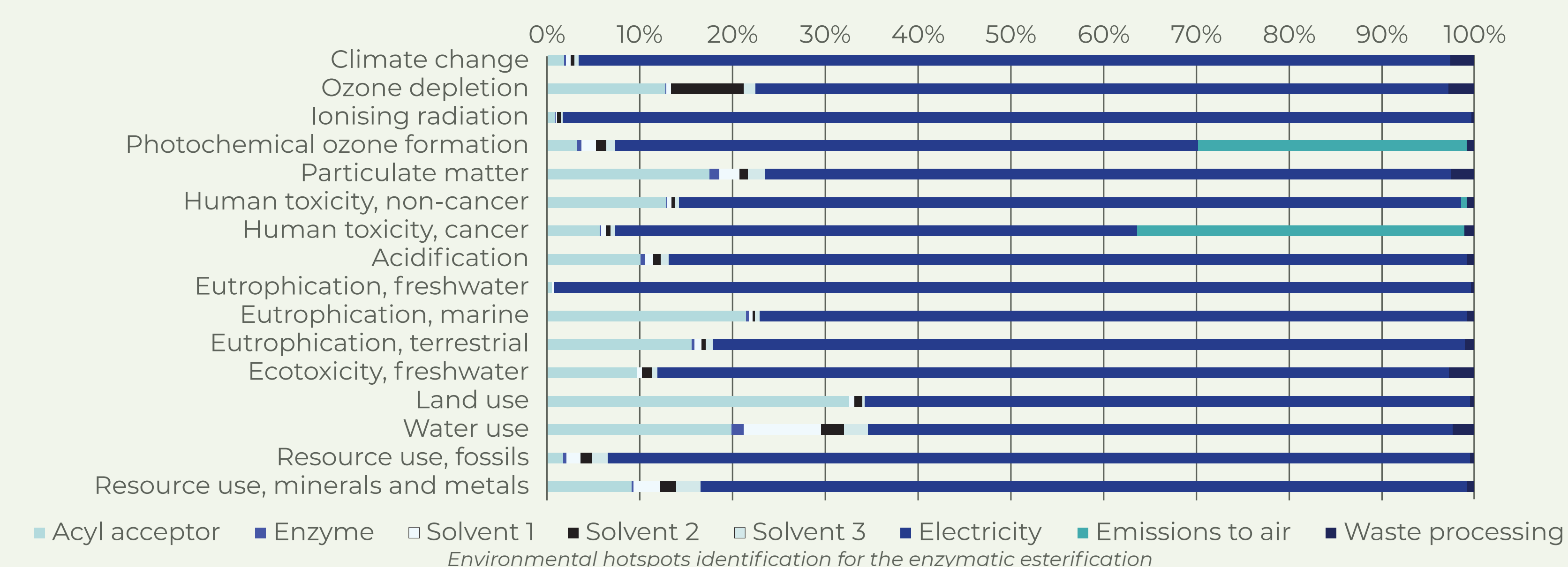
Sc-CO₂ Squalene isolation

Squalene is used in pharmaceutical industry and its hydrogenated form squalane is widely used in cosmetics. The richest source of squalene is shark liver oil, but it is present in minor amounts in vegetable oils as well. Supercritical CO₂ is being tested for the isolation of this valuable compound.



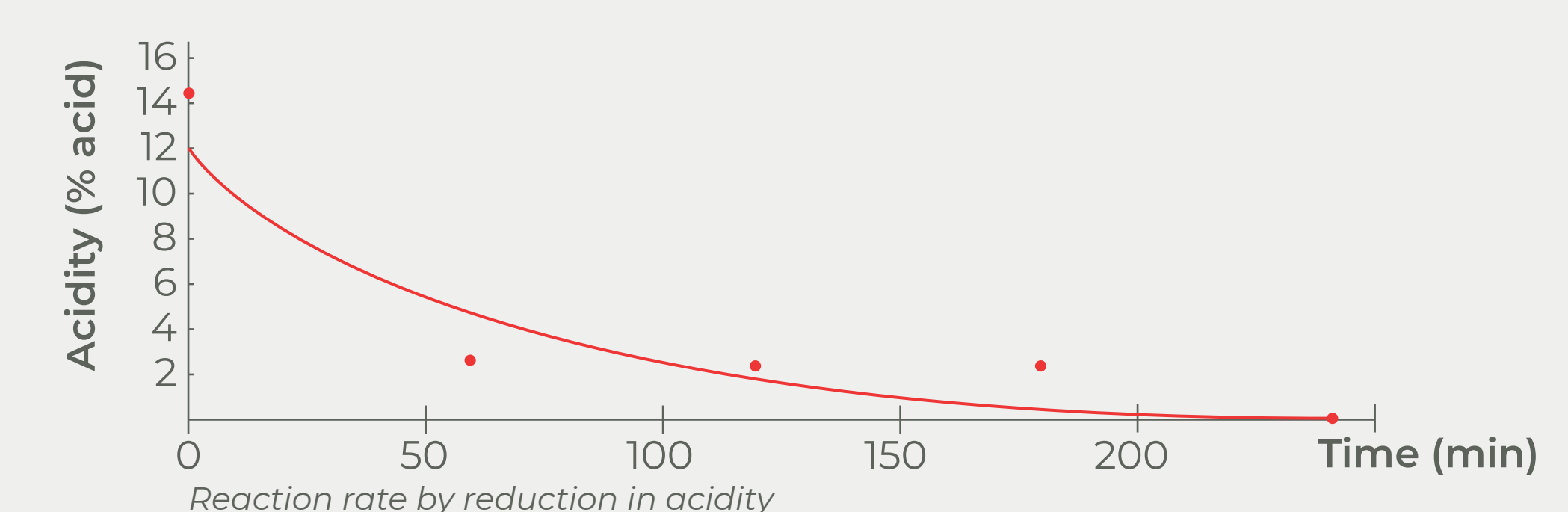
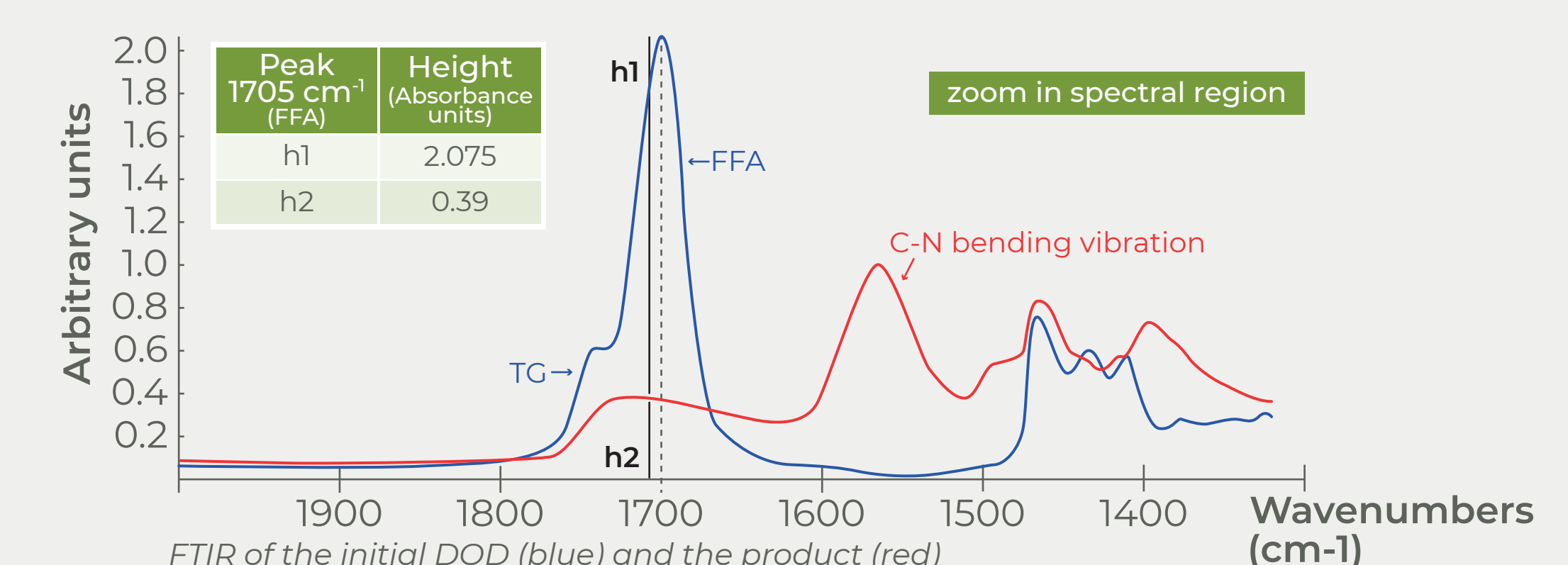
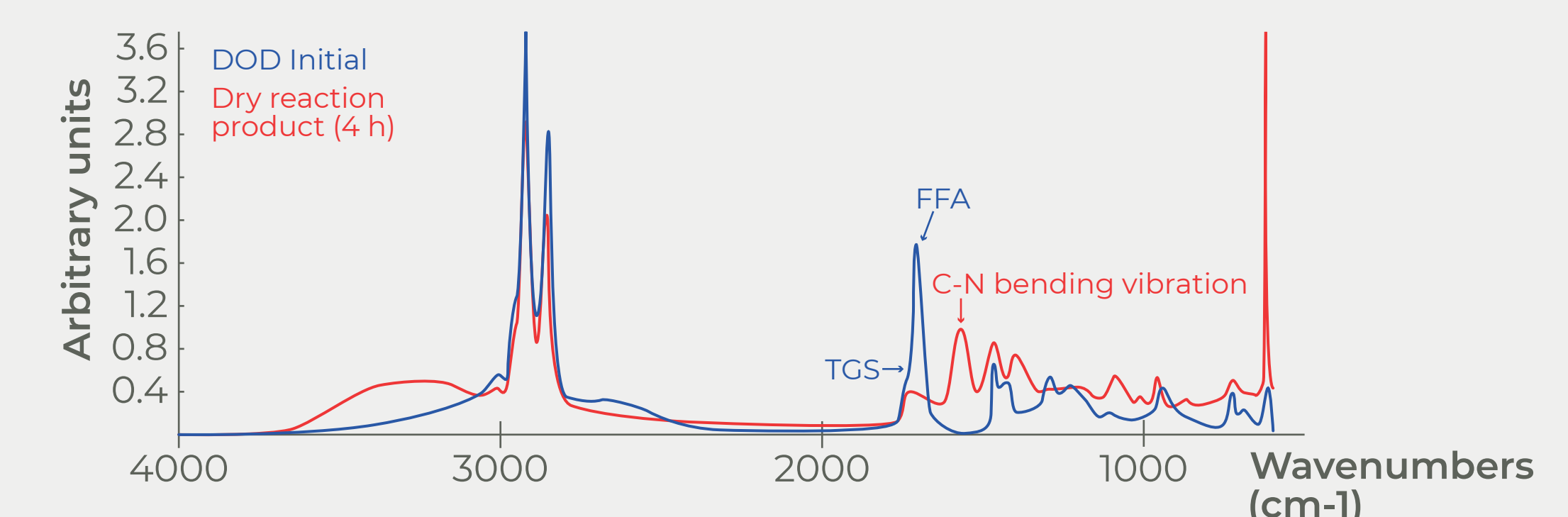
Sustainability assessment

Technical, environmental, economic, and social evaluation of the technologies developed, following life cycle perspective.



Surfactants

Biocompatible food-grade surfactants with increased solubility in cold water by chemical neutralization of FFAs with eco-friendly ionic liquids.



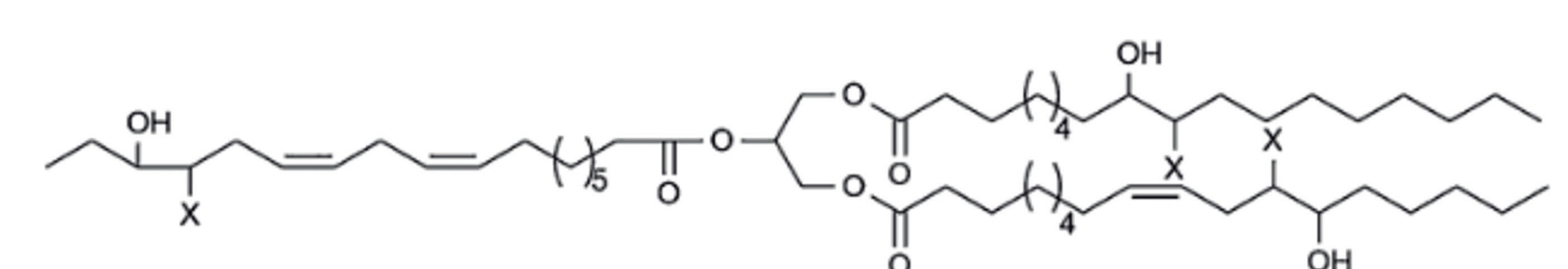
Surfactant concentration (%)	Solubility (water/isoprop)	pH (1% w/w)	Acidity (mg KOH/g)
29	yes	10	0.2

CMC (g/L)	Conducti (ms/cm)	Foaming (mm) t0	Foaming (mm) tS	Surface Tension (mN/m)
0.6	988	40	40	26.5

Characteristics of the synthesized surfactant

Polyols

Biodegradable base-oils obtained from DODs can also be used as raw material in the synthesis of sustainable polyols for polyurethane adhesive formulations.



PARTNERS



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