

Research topic:

**Materials**

DII research group

CHEMTEC



Paolo Sgarbossa  
paolo.sgarbossa@unipd.it  
Phone: +39 049 8275733



Roberta Bertani  
roberta.bertani@unipd.it  
Phone: +39 049 8275731



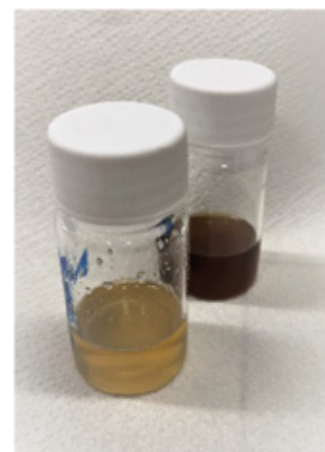
Mirto Mozzon  
mirto.mozzon@unipd.it  
Phone: +39 049 8275520

## Production of bioliquids from waste animal fats

The search of alternative fuel resources is a hot topic nowadays, looking for employing 20% of the total energy from renewable resources by 2020 in Europe. The Directive 2009/28/EC subsidizes the use of biomass, including vegetable oils and animal fats, for this purpose. Moreover, a sustainable waste management is fundamental to implement a circular economic approach in which the up-cycling of waste materials is useful to reduce the impacts associated to the related disposal (Directive 2008/98/EC).

Different waste animal fats have been considered in the study. They could be directly used as bioliquids if their physico-chemical properties comply with the quality standards, according with the regulation (EC) n. 1069/2009. The designed conversion process aims to reduce the intrinsic acidity with the esterification of FFAs, using different alcohols and catalysts in comparison, and a final neutralization with bases. The refining is achieved with activated carbons and other physical treatments in order to remove the remaining suspended particles and the particulate matter formed during the conversion process. The conversion efficiency amounts to 80-85%.

The bioliquids obtained from the bone, the chicken and the tallow fats comply with the quality limit values suggested by the standard UNI 6579: 2009 for the application in civil and industrial power plants (Tables 1) [1]. In particular, the bone fat bioliquid belongs to class B, as classified by the standard UNI/TS 11163: 2009, while the tallow fat can be directly used as bioliquid without any treatment, belonging to class C.



Collaborator:

Egle Rosson

egle.rosson@phd.unipd.it

www.dii.unipd.it

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Main research topics:

- Waste up-cycling.
- Physico-chemical characterization of different waste animal fats and related bioliquids.
- Design of conversion processes which are able to preserve the original physico-chemical properties and the triglyceride structures of the treated waste animal fats.
- Design of green physico-chemical treatments, optimizing the boundary conditions in order to increase the conversion efficiency and reduce as much as possible the mass loss and the formation of waste residues.
- Direct application of waste animal fats as bioliquids.

Table 1. Properties of the bioliquids obtained with the designed conversion process

Property	Unit	Bone fat biol.	Tallow fat biol.
Density (40 °C)	kg/m <sup>3</sup>	900 0.0211	903 0.0052
Viscosity (40 °C)	mm <sup>2</sup> /s	28 0.0009	22.1 0.0042
Acid value	mg KOH/g	0.496 0.0738	0.435 0.0431
Moisture content	% w/w	0.058 0.0014	0.096 0.0025
Total contamination	% w/w	N.A.	0.284 0.1353
Ash content	% w/w	N.A.	0.004 0.004
Peroxide value	meqO <sub>2</sub> /kg	12.9 1.403	N.A.
Iodine value	g/100g	50.5 1.06	28.6 0.2516
Group I metals (Na+K)	mg/kg	17.7	172
Group II metals (Ca+Mg)	mg/kg	38.8	49.5
Phosphorous content	mg/kg	44	290
Sulfur content	mg/kg	175	1826

[1] E. Rosson, P. Sgarbossa, F. Pedrielli, M. Mozzon, R. Bertani - Waste Management, submitted.