
Universidade de Vigo

USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

UNIVERSIDADE DA CORUÑA

REGALIS

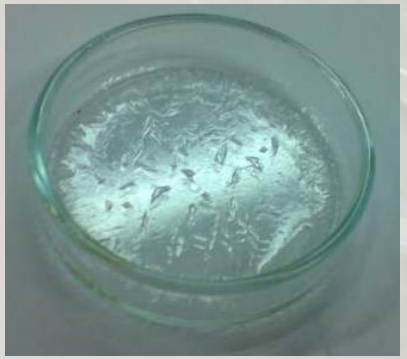
Rede Galega de Líquidos Iónicos (REGALIs)

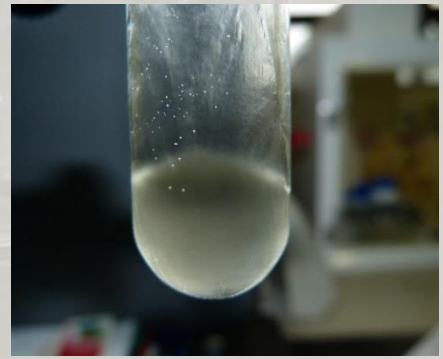
# SYNTHESIS AND PROPERTIES OF A NEW IONIC LIQUID WHICH JELLYFIES AT ROOM CONDITIONS

*Oscar Cabeza, Esther Rilo, Juan Vila, Luisa Segade, Luis M. Varela, Elena López-Lago, Miguel Vilas, Emilia Tojo*

**IN A RECENT PAPER WE PUBLISH THE FORMATION OF A RIGID GEL FOR SOME AQUEOUS MIXTURES OF THE 1-ETHIL-3-METHIL IMIDAZOLIUM OCTYL SULFAT (EMIM-OS).**

Physical properties of aqueous mixtures of the ionic 1-ethl-3-methyl imidazolium octyl sulfate: A new ionic rigid gel.
O. Cabeza et al., *J. Chem. Thermodyn*. 75 (2014) 52-57.

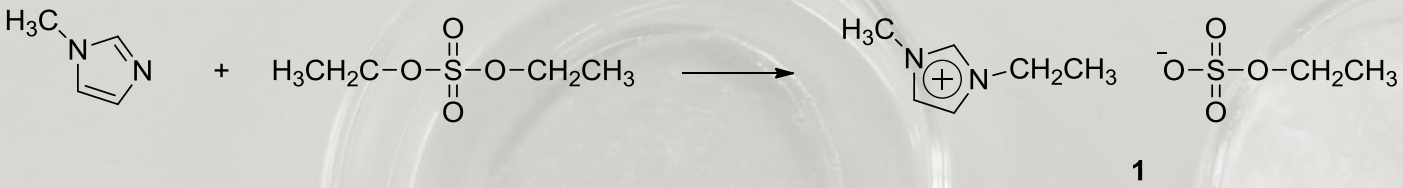




**WE OBSERVED THAT THE EMIM-HEXYL SULFATE DO NOT FORM A RIGID GEL STATE FOR ANY WATER CONCENTRATION AT ROOM TEMPERATURE. WHAT WOULD HAPPEN TO THE EMIM DECIL S?**

# EMIM-DS WAS TAILORED BY US BECAUSE IT IS NOT A COMMERCIAL IONIC LIQUID, AND WE DO NOT KNOW EVEN ANY MENTION OF IT IN THE LITERATURE. (Patent presented)

Etapa 1.- Cuaternización



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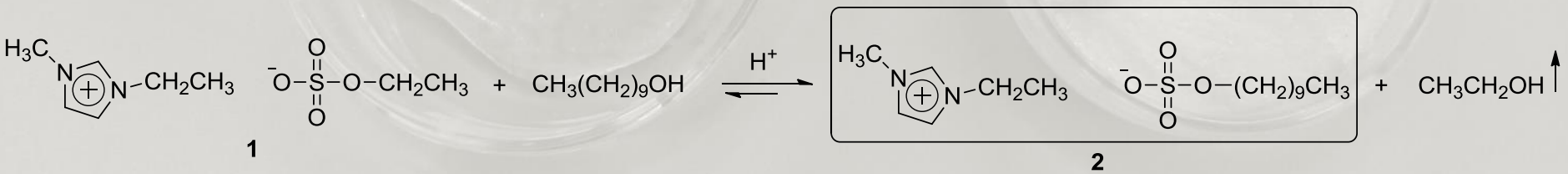
Etapa 2.- transesterificación



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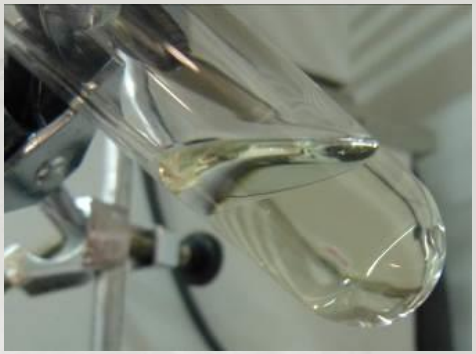
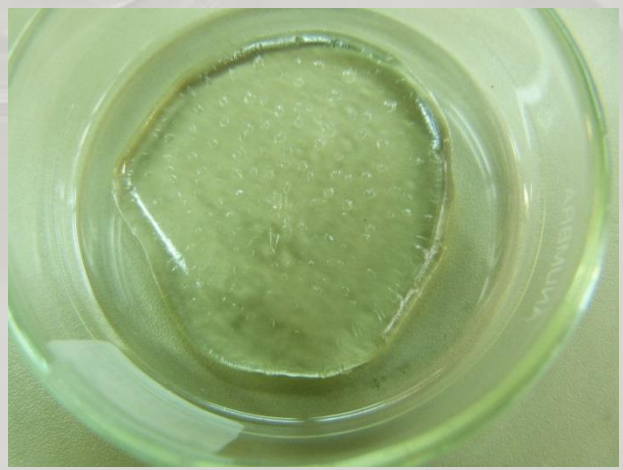
## SYNTHESIS HAS TWO STEPS:

- FIRST (QUATERNIZATION). WE OBTAIN EMIM-ETHYL SULFATE
- SECOND (TRANSESTERIFICATION). ADDING DECANOL WE OBTAIN THE EMIM-DS

# EMIM-DS ALSO CAN FORM A RIGID GEL. PURE IT IS A VISCOUS LIQUID AT ROOM TEMPERATURE (OR CRYSTAL SOLID), BUT LEAVING IT OPEN TO THE ATMOSTHERE ABSOBS WATER AND JELLYFIES

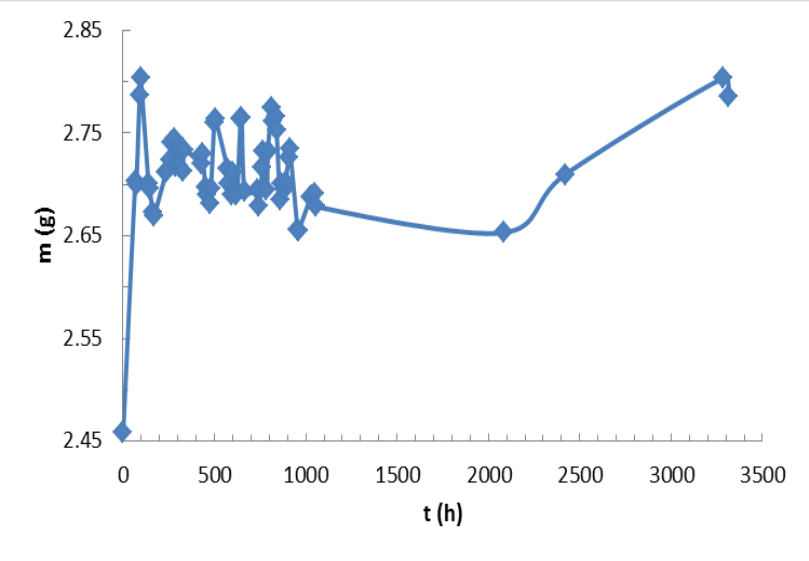


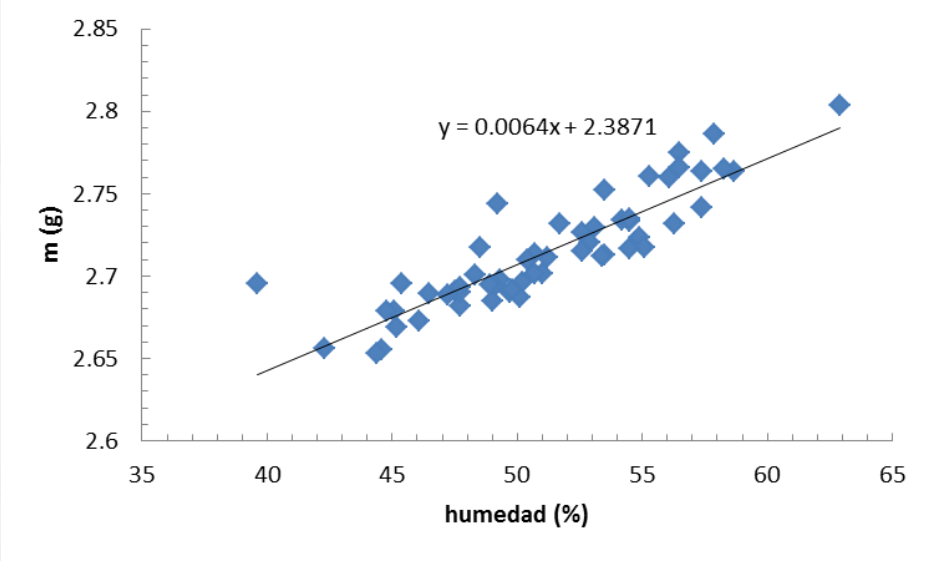
The three states of the hydrated EMIM-DS depending on temperature: From left to right, rigid gel (T between 15ºC and 60ºC), solid (T < 15ºC) and líquid (T > 60ºC)



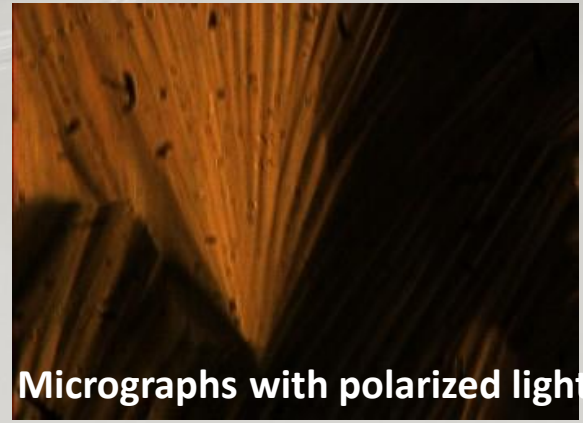
AT ROOM TEMPERATURE IT CAN BE A CRYSTLLINE SOLID OR A RIGID GEL, DEPENDIENG ON ITS THERMAL HISTORY!

# WATER MASS ABSORBED FROM ATMOSPHERE BY THE EMIM-DS (≈ 10% ± 2%). QUANTITY DEPENDS ON THE HYGROSCOPY GRADE

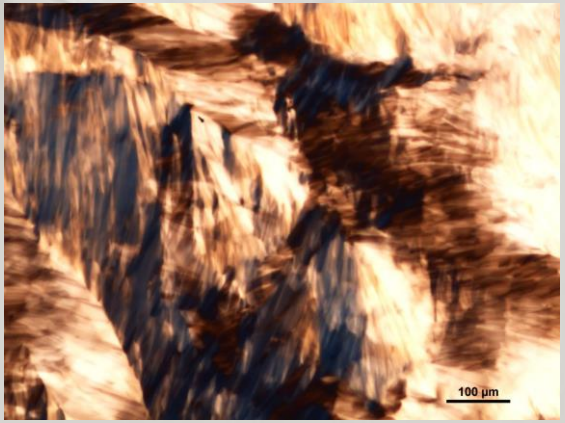



(Left) Variation of the hydrated EMIM-DS mass. Sample was left 5 months open to the ambient. (Left) Relation between mass of the sample and relative laboratory humidity percentage.

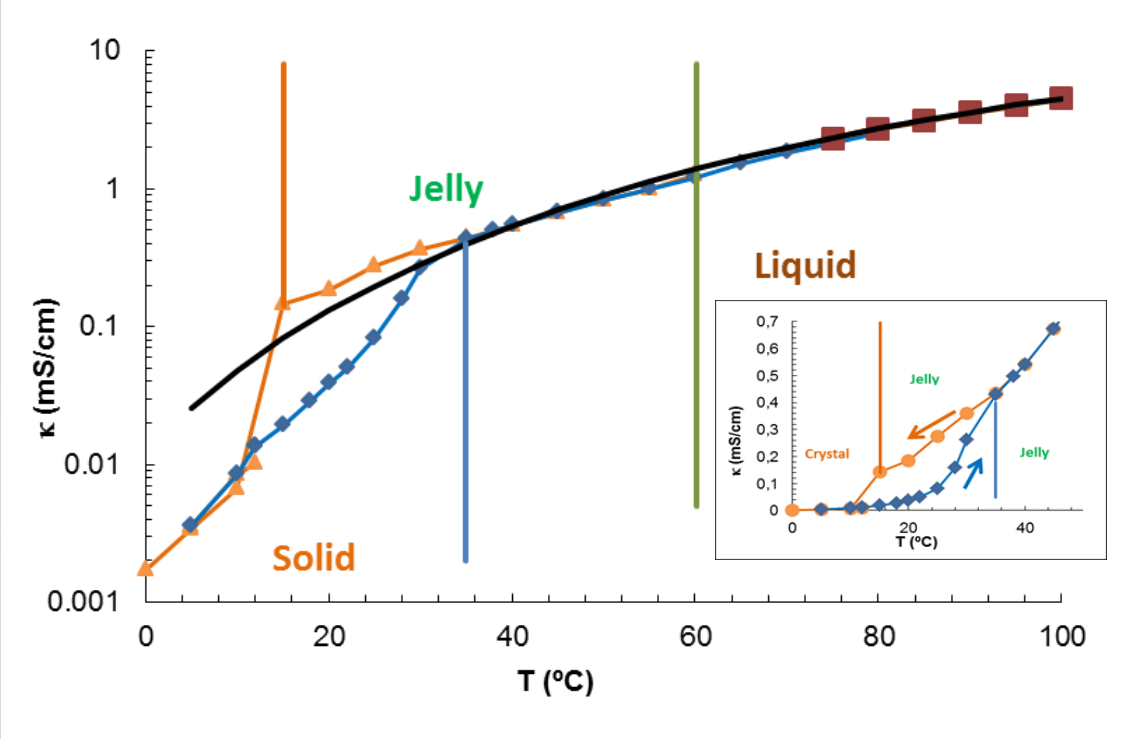


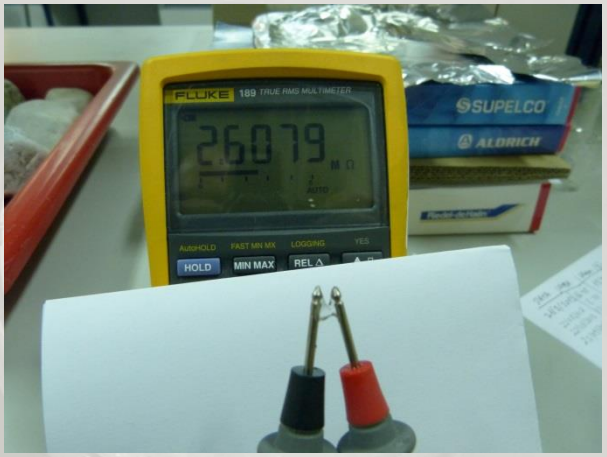
Micrographs with polarized light




Micrograph with polarized light

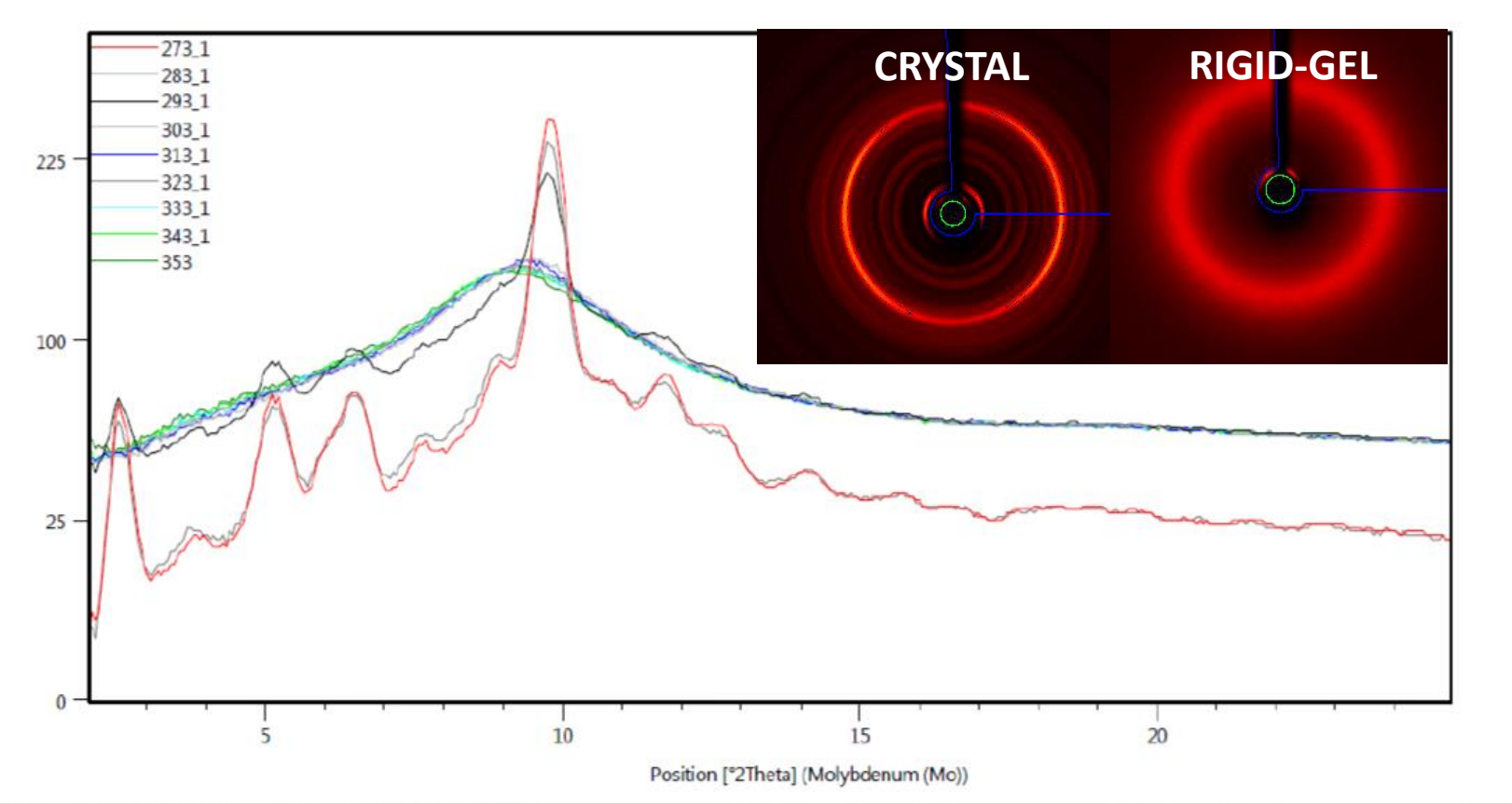
# IONIC CONDUCTIVITY MEASUREMENT FOR THE HYDRATED EMIM-DS



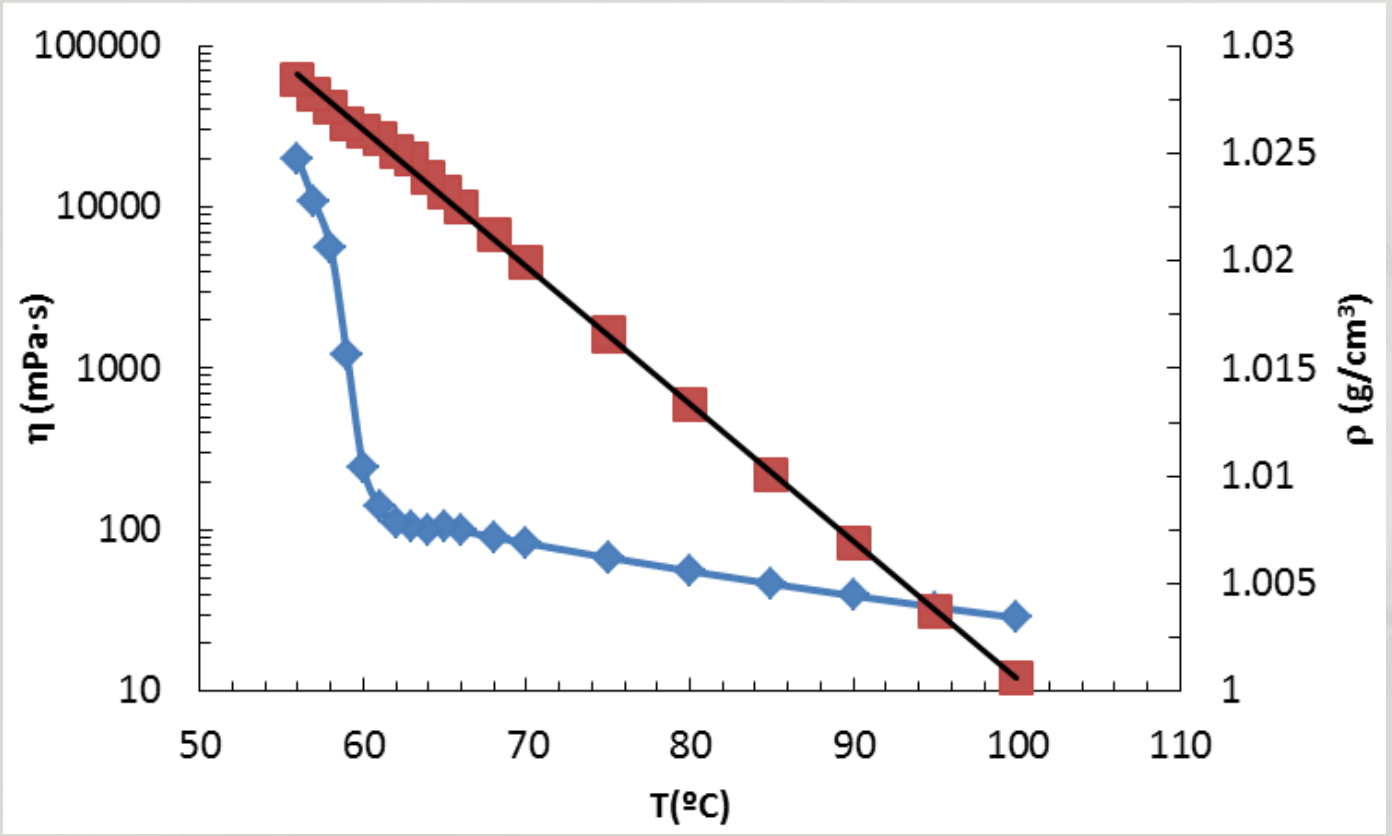

Electrical Conductivity of the hydrated EMIM-DS vs. T. The black line represents the best fit of a VTF equation: $\kappa = A \bullet \exp\{-B/(T(K)-T_0)\}$ (for data above 35ºC). Vertical lines indicate the transition temperatures. Observe the thermal hysteresis loop in the gel-solid transition (at 15ºC) and solid-gel (at 35ºC).

# X-RAY STUDY OF THE HYDRATED EMIM-DS



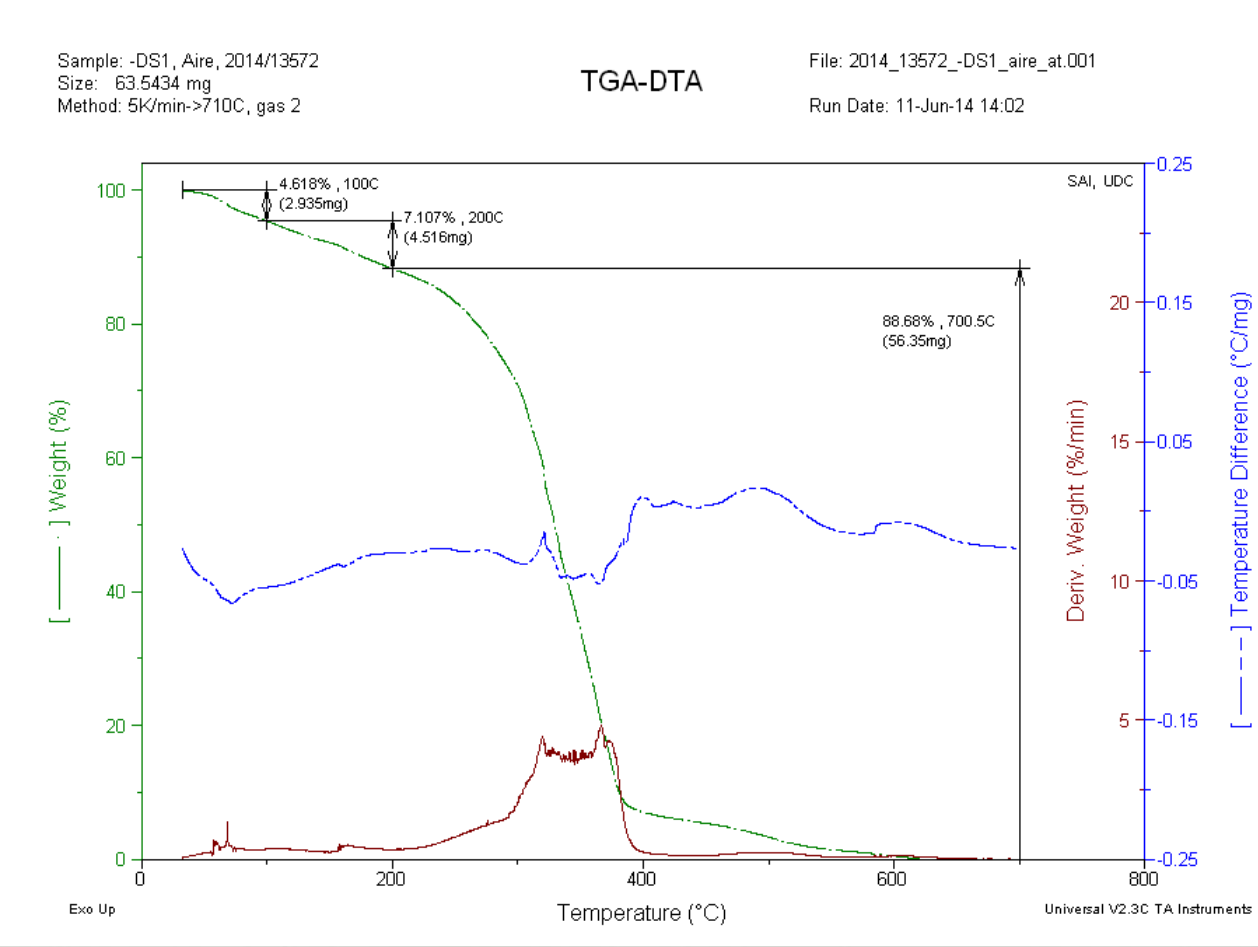

X-Ray diffractogram (Mo) at different temperatures. Below 15 ºC it is a crystalline solid.

# VISCOSITY AND DENSITY OF HYDRATED EMIM-DS



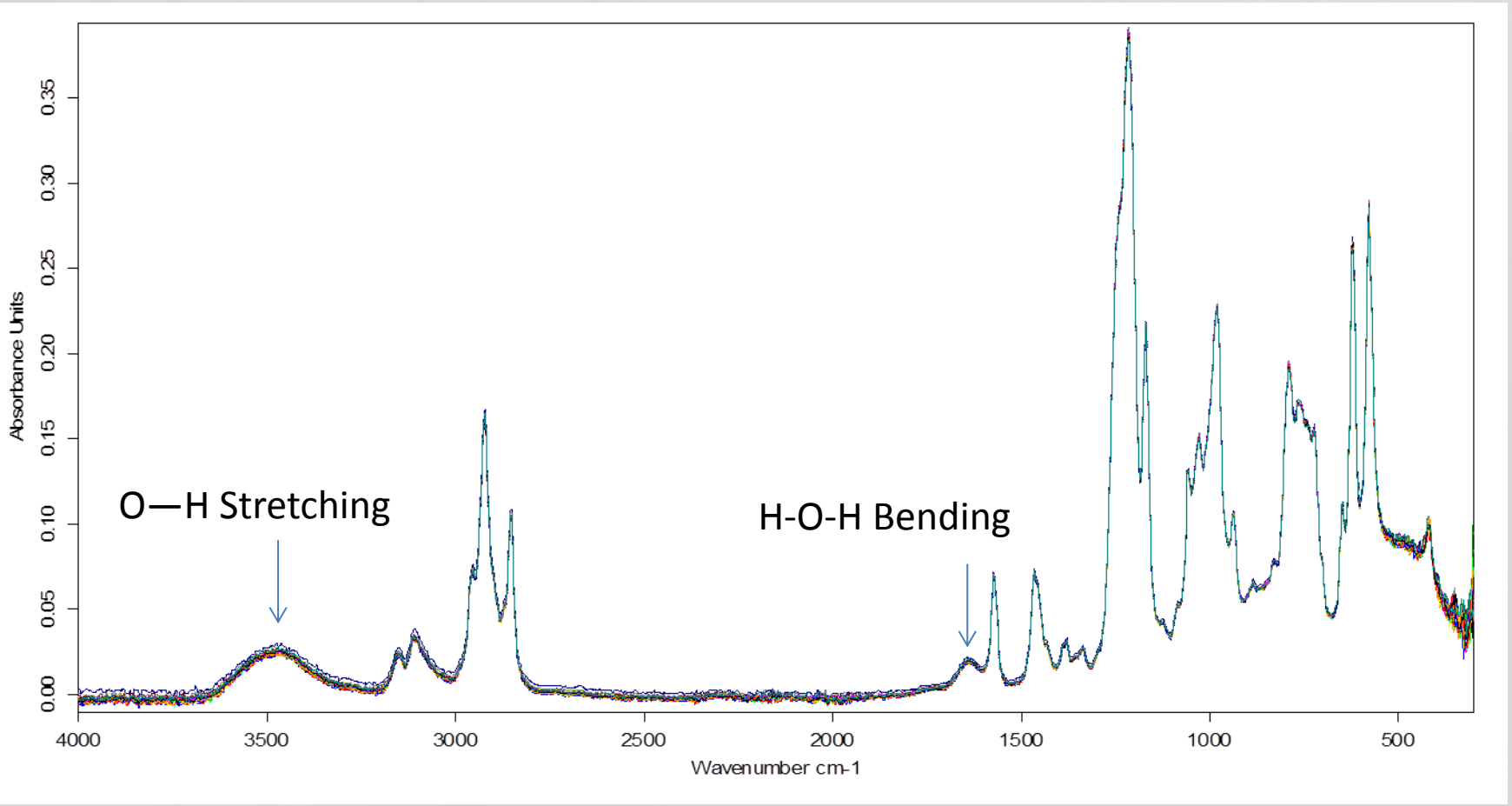

Viscosity, η, (rhombus) and density, ρ, (squares) of hydrated EMIM-DS in function of temperature. Black line represents the best linear fit to density.

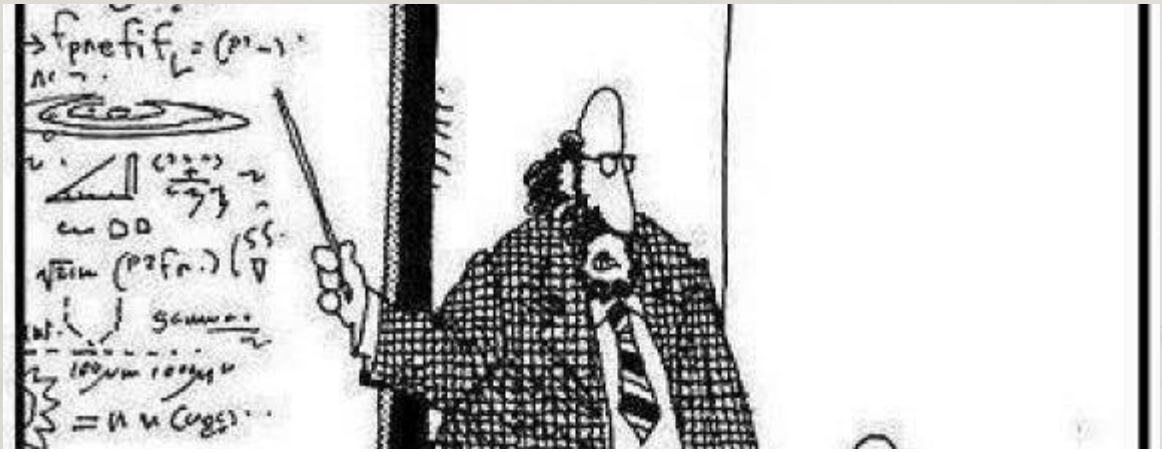
# TGA AND DSC OF HYDRATED EMIM-DS




**First sample lost the water, and then, about 300 K it begins to decompose.**

# INFRARRED DIFRACTOGRAM OF THE HYDRATED EMIM-DS





# THANKS FOR YOUR ATTENTION