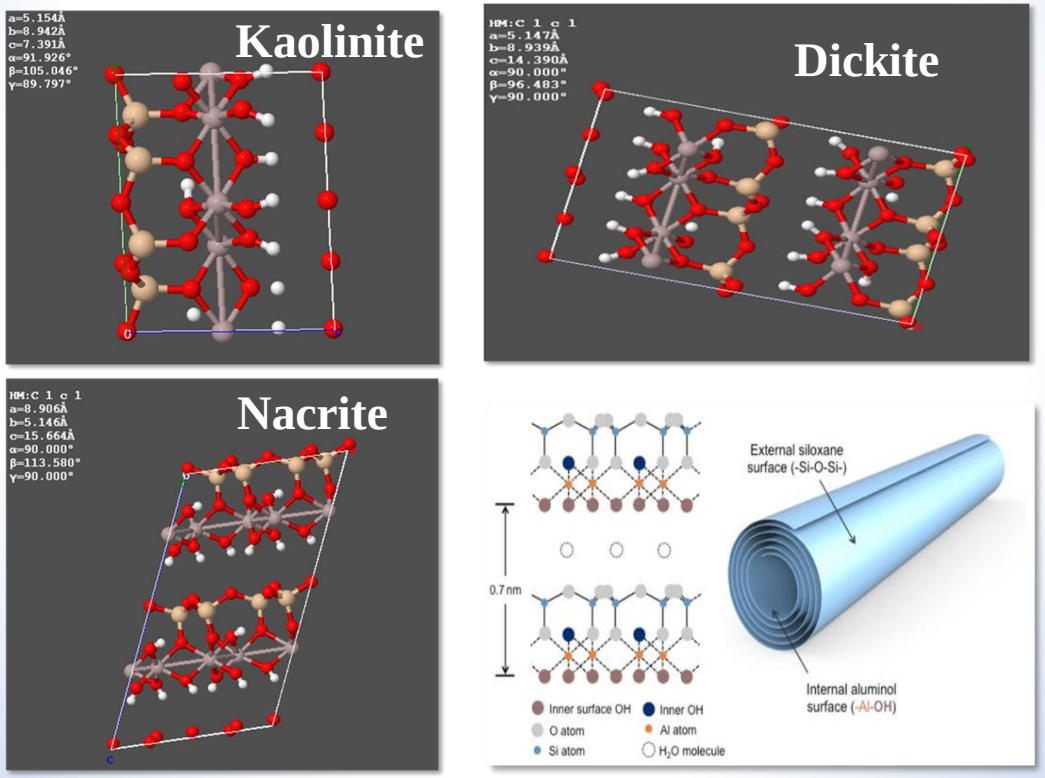
INTRODUCTION

- Kaolin is a rock composed mostly of minerals from the kaolinite group, which includes kaolinite and its polytypes, dickite and nacrite, as well as halloisite.

POLYTYPES



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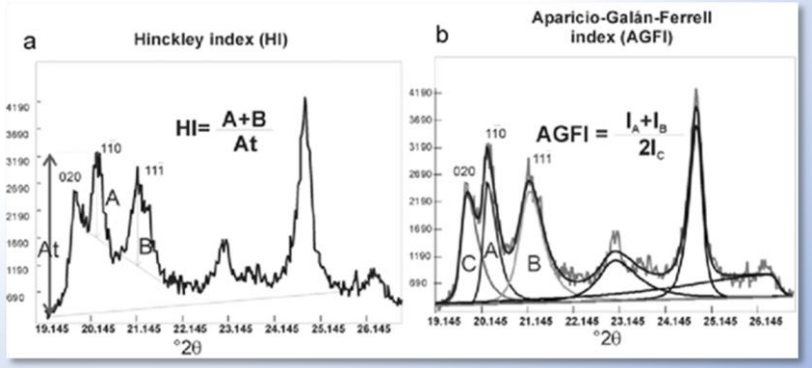
- Hernández et al., (2019) propose kaolin as an additive in the pharmaceutical industry since it contributes to improve the quality and safety of formulas.

PROCEDURE

- Five representative samples of the kaolinite group minerals and with diverse geographical locations have been selected: BUR (Burela, Spain), GOL2 (Golpejas, Spain), Ka2 (Georgia, E.E.U.U), MER (Merillés, Spain) and 2WD (Sucre, Panama).
- X-ray powder diffraction (XRD) measurements were carried out on a BRUKER D8 ADVANCE ECO diffractometer with theta2theta configuration.

- Kaolinite crystallinity index was calculated according to the methods proposed by Hinckley (1963) and Aparicio et al., (2006).



PROCEDURE

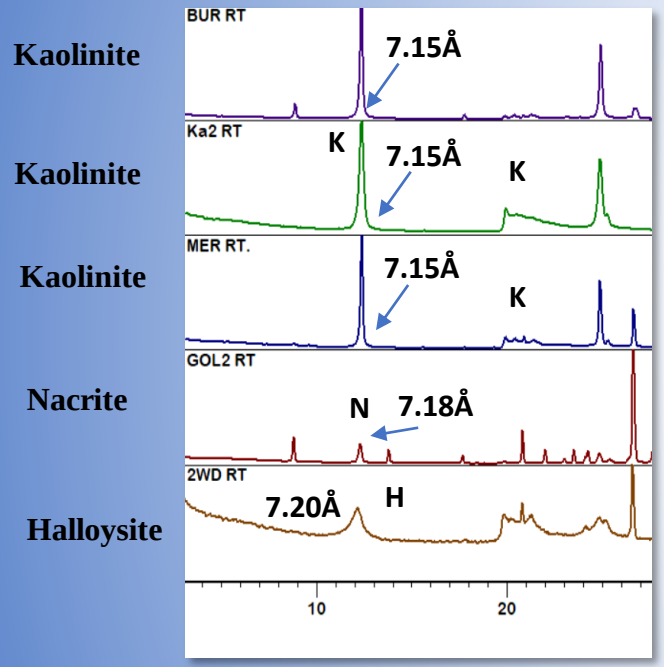
- The mineralogical identification was completed with the chemical analysis of the samples in the Activation Laboratory in Ontario (Canada), using FUS-ICP to major elements and FUS-MS to trace elements.

- The thermal analysis was carried out in the Geological Techniques Unit of the Complutense University of Madrid, using an SDT-Q600 model that works from room temperature to 1500º with heating rates from 0.1 to 100ºC/min.


SDT-Q600

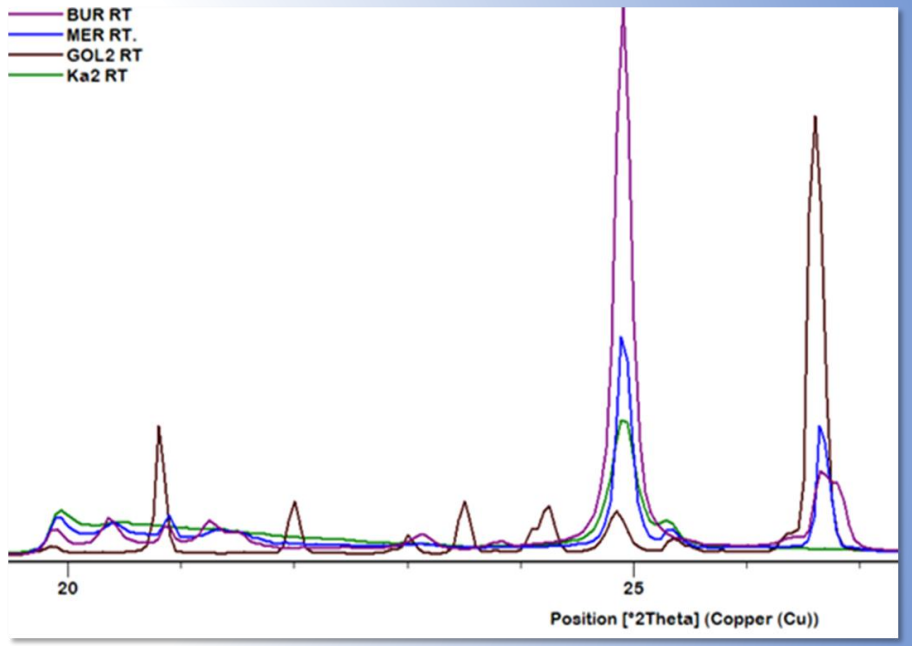
RESULTS AND INTERPRETATION

- Thanks to the X-ray diffraction, it is possible to identify that the BUR, KA2 and MER samples are kaolinite, GOL2 nacrite and 2WD halloysite, whose main impurities are quartz.



Kaolinite crystallinity index

X-ray powder diffraction



- BUR, MER and GOL2 samples are ordered-kaolinite (HI and AGFI >1) while Ka2 sample is a disordered-kaolinite (<0.90).

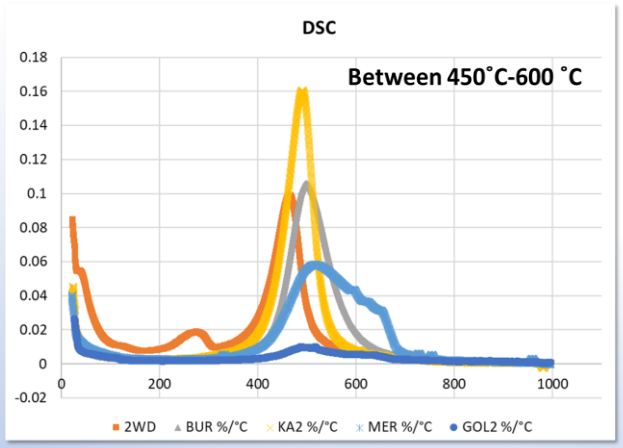
RESULTS AND INTERPRETATION

- The loss of ignition of kaolin samples ranges between 2.91 and 14.64%, which fits well with the pharmacopeial specifications for kaolin (<15%).
- Samples KA2, MER, 2WD and GOL2 showed acceptable toxicity of Pb with values of 47 ppm, 14 ppm, 11 ppm and 6 ppm, respectively.

SAMPLES	ppm Pb (<50 for topical use)	LOI (<15%)
BUR	65	12.84
KA2	47	14.64
MER	14	12.86
GOL2	6	2.91
2WD	11	14.1

BUR beats the pharmacopeial requirements for Pb

- TGA-DSC analyses show that the temperature of the main endothermic peaks (dehydroxylation of kaolinite and polytypes) is around 450ºC-600ºC.



Confirms the identified polytypes

CONCLUSIONS

MER and Ka2 samples are adequate to be used as pharmaceutical ingredients, without needing to be treated previously.

BUR sample, with 91% of kaolinite, fulfills levels of Pb.

On the other hand, the presence of important quantities of quartz and oxides in GOL2 and 2WD samples, could compromise their use and the impurities should be removed in order to be used in industry.

REFERENCES

- Aparicio, P., Galán, E., & Ferrell, R. E. (2006). A new kaolinite order index based on XRD profile fitting. Clay Minerals, 41(4), 811-817.
- Hernández, A. C., Sánchez-Espejo, R., Meléndez, W., González, G., López-Galindo, A., & Viseras, C. (2019). Characterization of Venezuelan kaolins as health care ingredients. Applied Clay Science, 175, 30-3
- Hinckley, D. N. (1963) Variabilitiy in “Crystallinity” values among the kaolin deposits of the Coastal Plain of Georgia and South Carolina. Clays and Clay Minerals, 11, 229-235p.