Title: Pseudoboehmite nanoparticles for metformin release

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Introduction: Nanoparticles are thermodynamically unstable and have a natural tendency to aggregate. In this way, it becomes a great challenge to prepare stable nanomaterials to avoid particle agglomeration. Pseudoboehmite is a synthetic ceramic material obtained by the sol-gel process consisting of a network of inorganic oxides with high porosity and purity that can be used for drug release systems (1,2). Triton™ X-114 is widely used as a dispersant, capable of modifying the particle's surface, promoting hysterical impediment and, in some cases, generating electrical charges that determine repulsive forces.

Methods: Pseudoboehmite solutions were prepared by adding different levels of Triton™ X-114 to these solutions. The aliquots were analyzed using the Dynamic Light Scattering technique (DLS) to evaluate the particle size and the suspensions' stability by measuring the Zeta potential. This work studied the interaction between Metformin (Metformin Hydrochloride) and pseudoboehmite treated with Triton™ X-114 to use this ceramic material in the controlled drug release. X-ray diffraction, FTIR, differential thermal analysis, and thermogravimetric analysis were used to characterize pseudoboehmite. The in vitro metformin release assay was evaluated using UV-Vis spectrophotometry.

Results: The X-ray diffraction results, Figure 1, show the characteristic diffraction pattern of pseudoboehmite and the Miller index of the peaks. In the in vitro release experiment, the metformin concentration increased rapidly and approached the equilibrium at 20 mg/L after three hours. The in vitro release of metformin without pseudoboehmite, the equilibrium was established at 50 mg/L.

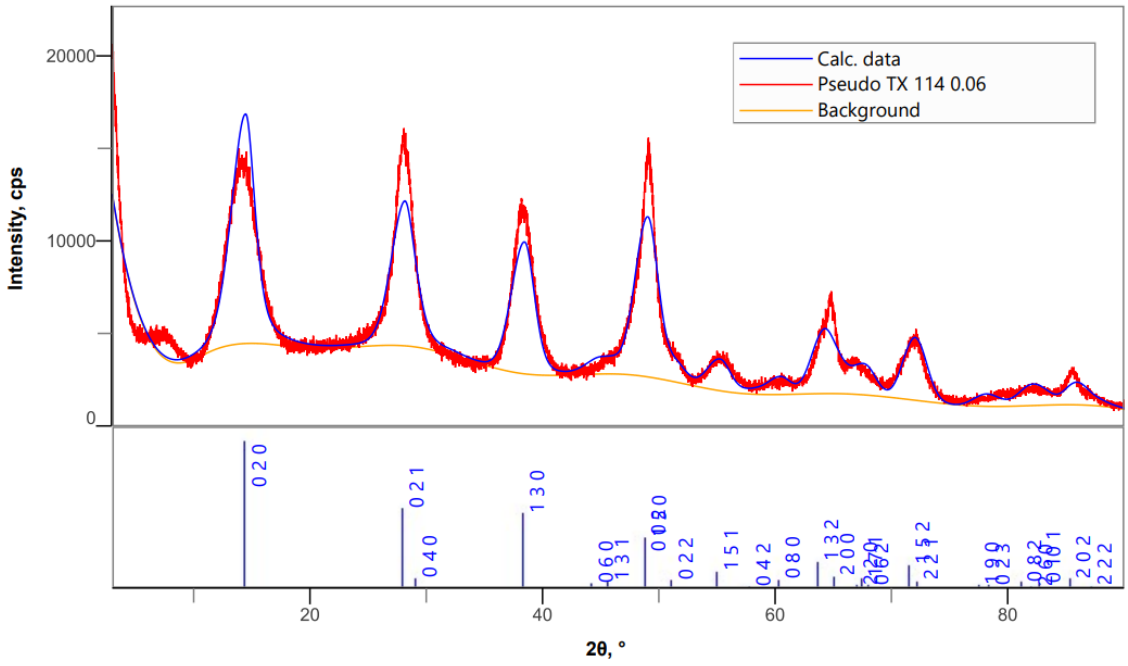

Figure 1 X-ray diffraction results of pseudoboehmite sample

Conclusion: The characterization techniques show that high pure pseudoboehmite was produced with no other phases. The metformin supported in pseudoboehmite shows a lower concentration of metformin in equilibrium, probably due to the adsorption of metformin in pseudoboehmite structures.

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References

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(2) PERES, R.M., et al. Pseudoboehmite as a drug delivery system for acyclovir. **Sci Rep** 11, 15448 (2021).

Presenter biography: Antonio Hortencio Munhoz Junior is a Professor at the School of Engineering at Mackenzie Presbyterian University. He works with the synthesis and applications of pseudoboehmite for drug release systems.

Example of Learning Objectives: Understand the process of drug release of metformin in the presence of pseudoboehmite. Evaluate the differences between metformin release with and without pseudoboehmite. Improve the release of metformin.