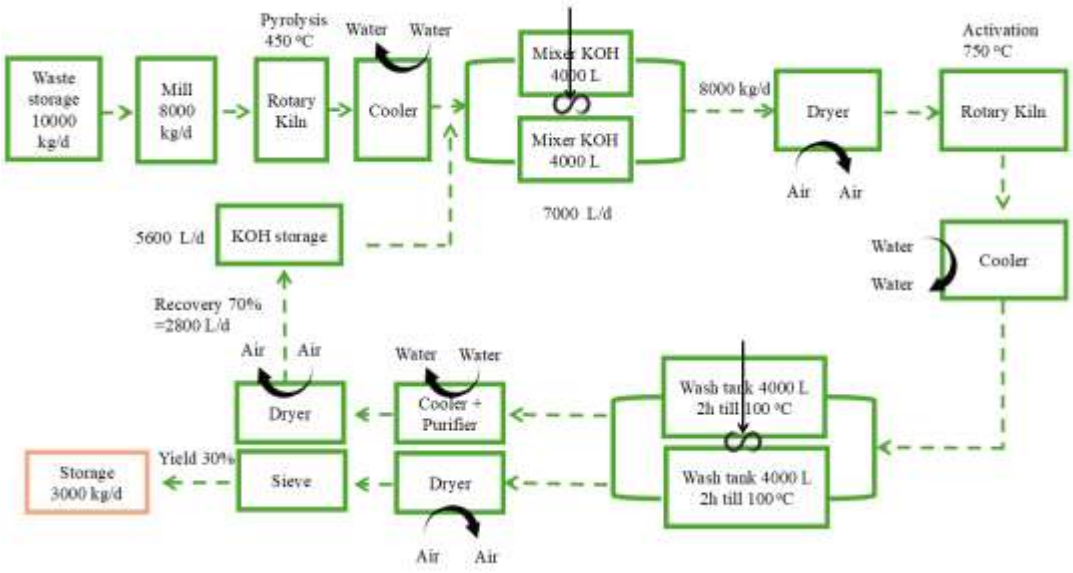
Prof. Dr. habil. Bayoumi Hamuda Hosam (Obuda University)

Response to the final defense comments

1- Given the scope and outcomes of your study, what specific treatment system would you advocate for implementation in industrial-scale applications within the field of Environmental Engineering, particularly those targeting pharmaceutical removal from wastewater streams?

Thank you so much for your question. I would highly recommend OSAC as a superior adsorbent compared to others, primarily because of its outstanding performance in contaminant removal. OSAC has shown an impressive removal efficiency of around 99% for pharmaceuticals such as diclofenac and ciprofloxacin in multiple water matrices, including Milli-Q water, lake water, and wastewater. A key benefit of OSAC is its reusability; it remains effective through up to seven regeneration cycles. Additionally, it performs reliably across a wide pH range (2 to 11) and accomplishes significant removal of the target compounds within just 75 minutes, outperforming many other activated carbons. Furthermore, OSAC presents a cost-effective solution, with a production cost of $3.77 per kilogram, significantly lower than that of other systems such as BPAC ($4.27/kg) and FPWAC ($4.53/kg).



Process flow diagram for chemical activation production of OSAC

References

Al-Sareji, Osamah J., Ruqayah Ali Grmasha, Mónika Meiczinger, Raed A. Al-Juboori, et al. "A sustainable and highly efficient fossil-free carbon from olive stones for emerging contaminants removal from different water matrices." *Chemosphere* 351 (2024): 141189.

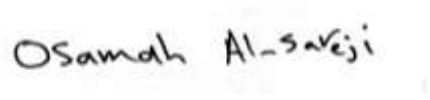
2- Can you elaborate on the scientific implications of pharmaceutical pollutants adhering to the Langmuir isotherm model? Specifically, what does this suggest about the nature of the adsorption process?

Thank you so much for your question. When pharmaceutical pollutants adhere to the Langmuir isotherm model, it suggests that the adsorption process is characterized by a monolayer formation (single layer) on a surface of AC. This implies that each pollutant molecule occupies a single site, and once a site is filled, no further adsorption can occur at that location. So, the activated carbon here has a relatively uniform surface in terms of adsorption energy and capacity.

References

Langmuir, Irving. "The constitution and fundamental properties of solids and liquids. Part I. Solids." *Journal of the American chemical society* 38, no. 11 (1916): 2221-2295., doi: 10.1021/ja02268a002.

Duff, David G., Sheina MC Ross, and D. Huw Vaughan. "Adsorption from solution: An experiment to illustrate the Langmuir adsorption isotherm." *Journal of Chemical Education* 65, no. 9 (1988): 815.



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