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Obtaining zeolites synthesized from industrial waste for application in methylene blue adsorption

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In this work, the zeolites structures LTA, FAU, SOD, CAN and GIS were synthesized by the alkaline fusion method followed by hydrothermal treatment in a autoclave using aluminum anodization residues (RAA) and waste glass powder (WGP) as alternative sources of SiO_2 and Al_2O_3, respectively. The zeolite structures were confirmed by X-Ray diffraction (Figure 1A). Zeolites were used to investigate the kinetic mechanism of adsorption of methylene blue dye. The experiments were carried out in batch mode at pH = 3, 6 and 10 at 25°C. The data obtained in the adsorption isotherm study were adjusted by the non-linear Langmuir and Freundlich models, which Langmuir being the best fitting model with R^2 values > 0.9 for all zeolites (Figure 1B). The Qmax values were close to the Qexp values whose best removal efficiency was obtained at pH = 6 for the GIS zeolites (93.2%) and CAN (77.9%). At pH = 3 the best removal efficiency was SOD (88.3%) followed by LTA (84.9%). Meanwhile, at pH = 10, FAU zeolite was the most efficient (97.6%). The kinetic data were best fitted with the non-linear pseudo-second order model (PSO) with values of $0.97 > R^2 > 0.99$ for all zeolites investigated (Figure 1C) with K_2 values between $1.18x10^{-4}$ and $4.57x10^{-4}$.

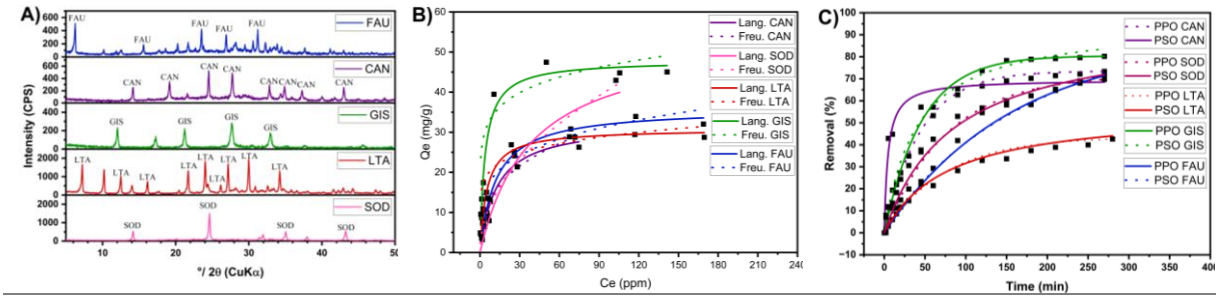

Figure 1. A) diffractograms of the zeolites FAU, CAN, GIS, LTA and SOD, B) Adsorption isotherms at pH = 6 adjusted by the Langmuir and Freundlich models and C) Adsorption kinetics adjusted by the pseudo-first order (PPO) and pseudo -second order (PSO) at pH = 6.

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