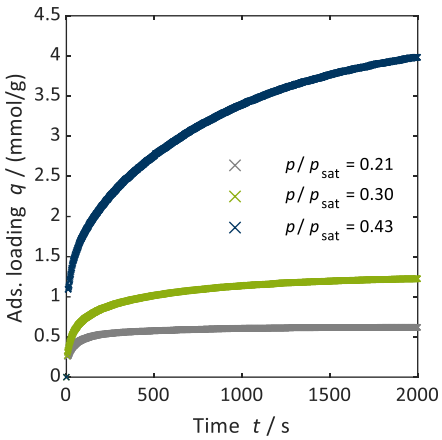

Fig. 4 Adsorption kinetics at low relative pressures and T_{ads} = 25.4 °C

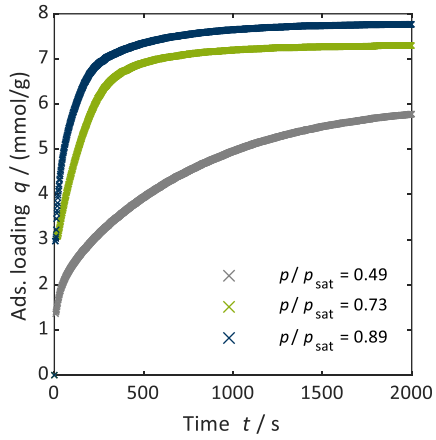

Fig. 5 Adsorption kinetics at high relative pressures and T_{ads} = 25.4 °C

A comprehensive study of the influence of OFG on H_2O vapor adsorption kinetics by Fletcher et al. [7] confirms this behavior. Considering a low presence of OFG on high-temperature treated carbons, decreasing rate constants at higher p/p_{sat} indicate a dominance of associative adsorption over surface functional groups.

As a consequence, the modeling of the kinetic adsorption behavior with respect to the PSK model needs to be rethought. The occurrence of slow and fast kinetics for H_2O vapor is not only necessarily coupled to the morphology-dependent diffusion of molecules through the char particles, but more to the presence, initial formation and diffusion of greater H_2O assemblies.

5. CONCLUSION

In this work the adsorption behavior of H_2O vapor on the MCC-HTC char was investigated in order to establish an experimental data basis for PSK modeling. Therefore, kinetic adsorption measurements were performed along three adsorption isotherms at T_{ads} = (25.4, 35.3, 48.8) °C. Furthermore, the quantification of OFG by TPD measurements and analysis could be associated to the adsorptive behavior of H_2O vapor. The analysis of the effluent gas curves results in a low content of acid groups (0.2 mmol/g) with respect to the overall amount of OFG (1.5 mmol/g). Due to the low presence of acid groups, the shape of the measured adsorption isotherm is predominantly determined by pore morphology and the formation of H_2O clusters. In the further development of the PSK model, the equilibrium part needs to be modified in consideration of established model approaches for H_2O vapor adsorption, which can be found in the literature.

As part of future research, the kinetic adsorption behavior of H_2O vapor is investigated for other samples e.g. chars from different biomass origin or with an intended higher content of OFG.

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