

**Évaluation d'une utilité potentielle de quelques argiles  
comme adsorbant pour VOC's par détermination de la chaleur  
d'adsorption en utilisant la spectroscopie de FTIR**

**Evaluation of potential use of some clays as adsorbent for  
VOC by determination of adsorption heat using FTIR  
spectroscopy.**

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**EVALUATION OF POTENTIAL USE OF SOME CLAYS AS ADSORBENT  
FOR “VOC” BY DETERMINATION OF ADSORPTION HEAT USING  
“FTIR” SPECTROSCOPY**

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Adsorption is well established as a unit operation for pure gases production and also for waste streams treatment. The process is still attractive regarding its cost/ performance ratio. Hence the choice of potential adsorbent should avoid chemical bonding with adsorbate and disposes of lower adsorption energy so that adsorbed species can be removed easily. For this purpose determination of adsorption heat data could be very useful for estimation and prediction of the potential use of an adsorbent material.

For determination of the heat effects generated by adsorption processes of systems involving relatively weak interaction, the isosteric method was found to be efficient <sup>[1]</sup>. However, when the process involves significant irreversible adsorption, Temperature Programmed Desorption (TPD) based on the dependence of peak temperature on the heating rate might be more appropriate for the investigation of thermal behaviour of adsorption and/or desorption process <sup>[2,3]</sup>. The heat data provided is also of interest, not only, in terms of adsorbent regeneration but also for security and safety of industrial plants. For instance, VOC desorption from activated carbon bed, the most used material, may induces local temperature rises that may cause fire hazards.

Recently, we have presented an experimental approach for measurement of adsorbed and desorbed amounts under dynamic conditions using quantitative analysis of Fourier transform infrared spectroscopy (FTIR) <sup>[4]</sup>. In the present work the obtained reversible and irreversible adsorbed amounts are used to determine the heat of adsorption and desorption, respectively, according to isosteric and TPD methods. The approach was applied to explore, potential valorisation of local bentonite clay as an adsorbent of VOC pollutant and could be considered as starting point of further development of innovative materials involved in environmental engineering control with a perspective of local sustainable development.

## References

1. Sircar, S. Heat of adsorption on heterogeneous adsorbents. *Appl. Surf. Sci.* 2005, 252, 647–653.
2. Cvetanovic, R.J.; Amenomiya, Y. Application of a temperature-programmed desorption technique to catalyst studies. In *Advances in Catalysis*, eds. D. D. Eley and H. Pines.. Acad Press, New York, 1967; 17, 103.
3. Joly, J.P.; Perrard, A. Determination of the Heat of Adsorption of Ammonia on Zeolites from Temperature-Programmed Desorption Experiments. *Langmuir* 2001, 17, 1538-1542.
4. Zaitan. H.; Chafik, T. FTIR determination of adsorption characteristics for volatile organic compounds removal on diatomite mineral compared to commercial silica. *C.R. Chimie* 2005, 8, 1701-1708.