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Fractal approach to adsorption processes on envinronmental surfaces

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A great majority of the theories of adsorption of gases on solids employ models which are based on Euclidean geometry. Usually, the adsorbing surfaces have been modeled as planar surfaces, straight-line step edges, slit-like or cylindrical pores, etc. However, several systems of practical importance, e.g., the soils and soil compounds, have a structure, which cannot be described in terms of Euclidean geometry. However, the complexity of these surface can be captured by a single number - the surface fractal dimension. This is extremely convenient, appealing and allows for a great simplification of theoretical description of the adsorption phenomena.

The purpose of our presentation is to give an account of the developments and to describe various aspects connected with investigations of adsorption on fractal surfaces. In particular, we describe methods of evaluation of the fractal dimension, discuss thermodynamic approach and presents an overview of theoretical adsorption equations of gases on geometrically nonuniform and energetically homogeneous, as well as on geometrically and energetically nonuniform surfaces solid surfaces. The theoretical considerations are illustrated by examples of applications of the outlined theories to the description of adsorption of gases on soil compounds and on soils. We also discuss a possibility of application of computer simulation methods to study adsorption phenomena on fractal surfaces and in fractal porous networks.