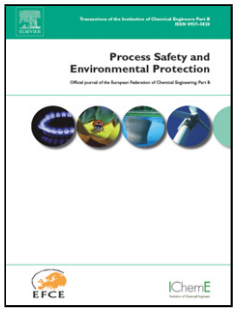

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Modeling of gas adsorption by aerosol plumes emitted from industrial sources

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Highlights

- 2-D model of gas adsorption by aerosol particles in air pollution plume is developed.
- The obtained results are compared with the available experimental data.
- The adsorbate concentration is calculated for the particulate matter $PM_{2.5-10}$.
- Spatial evolution of active gas concentration depends on stability of atmosphere.
- The vertical mean wind velocity profiles are fitted from the field measurements data.

ABSTRACT

Adsorption of trace atmospheric gases by aerosol particles contributes to the evolution of concentration distribution of the trace constituents and can affect subsequent chemical reactions in the atmosphere. We suggest a two dimensional model of adsorption of trace atmospheric constituents by aerosol particles in air pollution plume emitted from an industrial source. The model is based on an application of theory of turbulent diffusion in the atmospheric boundary layer (ABL) in conjunction with plume dispersion model and model of gas adsorption by porous solid particles. The wind velocity profiles used in the simulations were fitted from our data previously obtained in field measurements conducted in the Northern Negev (Israel) using the experimental wind mast. The developed model allows analyzing spatial and temporal evolution of adsorbate concentration in the gaseous phase as well as in the particulate matter. The