A fractal analysis is presented for the binding and dissociation (if applicable) of toxins and pollutants in solution to appropriate receptors immobilized on biosensor surfaces. Both a single- as well as a dual-fractal analysis is used to model the binding and dissociation kinetics. The dual-fractal analysis is used only when the single-fractal analysis did not provide an adequate fit. This was done using the regression analysis provided by Corel Quattro Pro 8.0. The fractal analysis is used to analyze the binding (and dissociation, if applicable) kinetics of (a) the binding (dose-response) of different concentrations (in mM) of phenol in solution to cells immobilized on a MEMS based cell-chip (Yoo et al., 2007), (b) binding and dissociation of 0.88 mM hydrogen peroxide mixed with GC2 (Escherichia coli strain) immobilized on a micro-cell chip (Yoo et al., 2007), (c) binding and dissociation of ethanol vapors in 40 % relative humidity (RH) to a CTO (powdered sample of chromium, titanium, and oxygen; titanium substituted chormium oxide) thick film in a sol-gel derived polycrystalline biosensor (Pokhrel et al., 2007), and binding and dissociation of different concentrations of Staphylcoccal Enterotoxin B (SEB) in solution to the antibody-functionalized microbeads on a sensor chip (Haes et al., 2006). The fractal analysis is used to provide a better understanding of the kinetics of reactions (involving pollutants and toxins in solution), and to relate the binding and the dissociation rate coefficients with the fractal dimension or the degree of heterogeneity that exists on the sensor chip surface. The fractal dimension provides a quantitative measure of the degree of heterogeneity on the biosensor surface.