Contribution ID : **188** Type : **poster**

Abnormal behavior of rupture force distribution in PEI/SiO_2 system

Understanding the dynamic properties of interacting molecules is an important issue in the field of designing micro and nano drug carriers or transfection systems. One of the most powerful research methods of these properties is dynamic force spectroscopy that allows to determine the interactions strength between single molecules, the local Young's modules or the energy landscapes. This technique enables also to explore the dynamic properties in the interacting proteins or polymer molecules systems. The dynamic force spectroscopy measurements derive the distributions of locally determined parameters which are analyzed based on models described in the literature, i.e. Bell-Evans model, Dudko, Hummer and Szabo model. Theoretical interpretation of experimental results is complex because of the wide distributions of measured forces for the multiple repetition of the experiment even for fixed rupture speed. At the same time there is a dependence of the rupture force on the rupture rate.

The results of rupture forces obtained for PEI / SiO_2 system were interpreted based on theoretical models of rupturing the interactions in the individual particles that are available in the literature. The general characteristics of results distributions obtained for the PEI-silica are consistent with existing models (narrowing of histograms with the increasing rate of the rupture speed, i.e. with the increase of the rupture force in time). However, none of the models describe accurately the measured distributions. Regardless of whether the Bell-Evans or HSD (Hummer, Szabo Dudko) models were used, it was not possible to obtain asymmetric, heavy-tailed distributions of rupture forces. It suggests that the rupture in such system cannot be reduced to the model describing a single particle overcoming a constant energy barrier. It is possible that the proper model of PEI - SiO_2 interaction should include interactions between larger groups of particles as well as fluctuation of an interaction potential that keeps a system together.

Primary author(s) : GUDOWSKA-NOWAK, Ewa (M. Smoluchowski Institute of Physics, Jagiellonian University, Kraków, Poland); BARBASZ, Jakub (Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Sciences, Kraków, Poland); SOFINSKA, Kamila (Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Sciences, Kraków, Poland); CIEŚLA, Michał (M. Smoluchowski Institute of Physics, Jagiellonian University, Kraków, Poland)

Presenter(s) : SOFINSKA, Kamila (Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Sciences, Kraków, Poland)