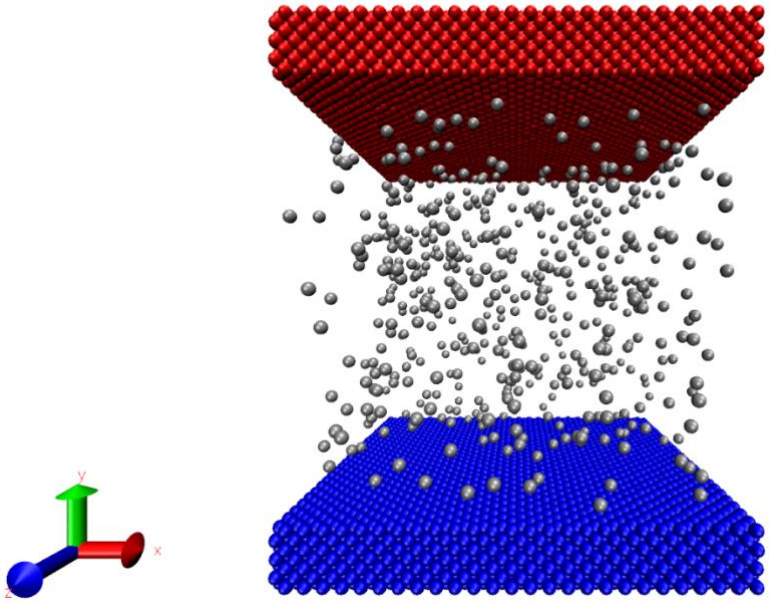
Rarefied gases – numerical simulations

Rarefied gas flows are broadly encountered in modern applications, such as vacuum technology, microelectromechanical and nanoelectromechanical systems (MEMS/NEMS), as well as those involving high altitude (e.g., space shuttles, satellites, and space stations).
In such applications due to very small size of the system or the presence of very low number of atoms, the Navier-Stokes continuum approach cannot be employed to describe the flow transport properties. Herein, particle based methods such as Molecular dynamics (MD) or Direct Simulation Monte Carlo (DSMC) are usually used to analyze the flow properties.
In this project funded by ASML Company, the main aim is to develop models and computational techniques to study heat and mass transport in rarefied gas flows in the exposure region of next generation Extreme Ultra Violet (EUV) Photo-Lithography Machines (PLM). Herein, MD simulation will be employed to study the gas/solid interactions, and to evaluate energy and momentum accommodation coefficients of rarefied gases in simplified but representative geometries inspired by EUV PLM applications.



Schematic of a MD simulation setup to study gas/solid interaction in a nanochannel

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