ID: 1.1.2b

Title: Ab initio molecular dynamics simulations of liquid and amorphous silica using Chebyshev-filtered subspace iterations

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\textit{Ab initio} molecular dynamics simulations are often used to simulate liquid and amorphous structures. Such simulations provide unique information for examining non-crystalline structures; however, they are computationally intensive, which limits the system size and simulation time. We have applied new algorithms to reduce the computational load. Our algorithms are based on Chebyshev-filtered subspace iteration, which allows us to avoid ``standard'' matrix diagonalizations of the Kohn-Sham equation, save the first time step of the simulation. Employing real-space pseudopotentials constructed within density functional theory, we were able to simulate up to 64 molecular units of SiO$_2$. We performed simulations for liquid silica at different temperatures and compared our results to previously performed work. We also generated an amorphous structure through quenching the liquid via a simulated annealing technique. Our quenching rate is much slower than previously performed \textit{ab initio} molecular dynamics simulations. We calculated the static structure factor, which is in an excellent agreement with neutron diffraction experiments. Moreover, we performed a structural relaxation to calculate the hyperfine parameter of E'_{γ} oxygen defect centers. We will also discuss the structural behavior of hyperfine parameters for oxygen-related vacancies.