

Abstract

Velocity map imaging (VMI) of photoproducts or fragments after a process of photoionization/photodissociation is a highly manifested ion imaging technique in the field of chemical and molecular dynamics which allows us to do measurements of velocity and angular distributions of the products and therefore it provides information on the various energy transfer processes. This technique is based on the use of an electrostatic lens to accelerate the ions towards a position sensitive detector. On proper adjustment of the voltages on the electrode plates, this lens has the advantage that it focuses ions with the same velocity to a single spot on the detector regardless of where the ions were created. In this thesis, I have discussed the details of the construction of such a VMI spectrometer and tried to comprehend all the nitty-gritty details pertaining to the setup. The first two chapters contain the physics and theory behind the working and building of such a spectrometer. The third chapter comprises of the simulation work concerning the design required, based on our needs and forms the foundations of the work done after that. Following this, further work involves the realisation of the simulated design on an optical bench in the laboratory and deals with a 3D model of the system. It deals with the various practical problems which could be encountered in the realization of the design. It is succeeded by the design of a molecular beam pulsed valve forming an integral part of the VMI spectrometer. The final chapter embraces a consummation of the work done till now and to be undertaken for assembling the spectrometer in the Femtosecond laser lab at IISER Mohali and realizing the goal of accomplishing attosecond XUV pulse characterization and time-domain spectroscopy.