

With terrorism becoming a global security hazard, home-made explosives (HME) are employed more and more by terrorists to create chaotic situations in daily lives of ordinary people like public transportation (air flights, commuter trains, etc.). In order to counter this growing threat, fast screening and detecting devices equipped with explosive sampling tools capable of pre-concentrating and selectively collecting explosive substances are in urgent demand. Among these common explosive sampling tools, pre-concentrators and swabs made from polymer materials are considered to be promising candidates and are widely used due to their flexibility and low cost. They are also attracting heavy research interests aimed at exploring the interactions between explosives and polymers in order to further enhance their sampling performance against explosives.

In this study, fundamental investigations are conducted on two major scales: first, the macro scale or meso scale in which case adhesion between explosive particles and polymer films is studied by atomic force microscope (AFM) force measurements; second, the micro scale or molecular scale in which case adsorption of explosive substances onto polymer surfaces in both gas and solution phases is studied by multiple techniques, such as gas chromatography (GC), UV/Vis, isothermal titration calorimeter (ITC). Experimental data (finished and ongoing ones) are examined in order to compare the sorption capabilities of different polymers against different explosive materials.