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Collision with surfaces

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New materials are increasingly complex and to gain the insight necessary for their intelligent engineering, entirely new experimental approaches are needed. In the past 20 years, a steadily increasing number of experiments on atoms and molecules have demonstrated the capability of few body collisions to investigate complex systems with sensitivity and specificity well beyond the limits imposed by conventional electron spectroscopies. Over the past decade or so, electron-electron coincidence spectroscopies, an experimental tool originally developed to study few body collision dynamics, have emerged as a powerful technique for obtaining detailed information on surfaces and overlayers. The class of one photon IN two electrons OUT experiments will be discussed with an emphasis on grazing incidence geometry that is expected to be particularly suited for studying system with reduced dimensionality. The crucial question of which is the dominant mechanism that leads to ejection of correlated electron pairs from the surface will be addressed. By the help of selected examples, it will be shown that, depending on the kinematics chosen, different kind of sensitivity and specificity can be exploited.