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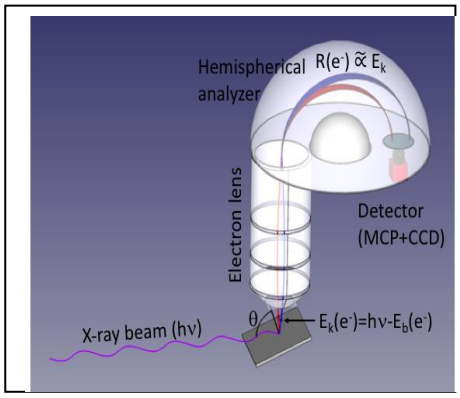
Bloch makes invisible visible

In today's scenario it is important to know about the materials around us. We try to know how one creates new materials with *breathtaking* properties. It is of great interest to understand the nature of their surface and how they interact with the environment.

Photoelectron spectroscopy is a powerful *shining star* for studying solid state physics. An example of such an interaction is corrosion - a process that is not yet completely understood on a molecular level. To get rid of corrosion, one needs to know what elements are present in the material and how they affect the process. We are helping the engineer by providing surface analysis that informs them how to design better products. Using photoelectron spectroscopy, we can obtain the chemical composition of the surface of materials.

To analyze the surface, photoemission is processed by irradiating a sample with a photon beam. If the beam has enough energy, it will kick out electrons from an atom in the same way a football player *kicks* a football. Now by detecting these electrons at a detector, one can measure their kinetic energy (speed of football) as well as different angles gives different momentum of the ejected electron. Further one can determine binding energy which is one type of force which holds electrons in an atom like the gravitational force between earth and us. Graph is recorded by analyzer over a wide range of electrons, binding energy gives a footprint of element present.

To determine, if the surface behaves like a metal or semiconductor, scientists look at the so-called valence band structure. Various properties (how they behave with the environment) are closely connected to the structure of the materials. Like graphene is the world's thinnest conducting material and when it is mixed with other material becomes strongest, therefore can be used at many purposes in day to day life. ARPES is a technique which directly measures the structure as well as finding gaps between two bands and hence a very useful tool.



Total energy resolution is a combination of photon energy resolution which comes from X-ray source and the electron energy resolution that comes from the electron analyzer. My main contribution is to characterize the photon energy resolution of the beamline which is important to make the total energy resolution of the beamline as small as possible so that one can resolve closely spaced peaks and determine the elements present accurately.

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Thesis: 30 credits, 10 June 2020
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MAX IV

FYSM30