

# The Art of Learning and Bridging Synthetic Biology

## Martin Cockcroft\*

*Departments of Microbiology & Immunology, Dartmouth College, Hanover, USA*

\*Corresponding author: Email: Cockcroft\_m@gmail.com

Citation: Cockcroft M (2022) The Art of Learning and Bridging Synthetic Biology. Electronic J Biol, 18(5):1-2

Received date: April 12, 2022, Manuscript No. IPEJBIO-22-14034; Editor assigned date: April 14, 2022, PreQC No. IPEJBIO-22-14034 (PQ); Reviewed date: April 28, 2022, QC No. IPEJBIO-22-14034; Revised date: May 5, 2022, Manuscript No. IPEJBIO-22-14034 (R); Published date: May 12, 2022, DOI: 10.36648/1860-3122.18.5.022

### Description

Charging effect of insulating samples is a major problem in photoemission spectroscopy. Herein, the charging of a LiNbO<sub>3</sub> wafer and glass plate was compensated by introducing nitrogen gas using a near-ambient pressure hard X-ray photoemission spectroscopy apparatus. This is because the secondary electrons created by electron scattering in the gas neutralized the charge on the sample surface. Moreover, the pressure required to compensate for the charging was found to strongly depend on the distance (d) between the sample surface and the aperture cone of the electron energy analyzer. At a normal distance of d = 0.3 mm, a pressure of 2500 Pa was required to compensate for the charging of the insulating samples. However, at d = 2.1 mm, the required pressure was reduced to only 250 Pa. The large d dependence of distance can be attributed to that electron scattering is largely disturbed by the aperture cone at small d values.

### X-ray Photoelectron Diffraction

We discuss some experimental facets of electron pair emission from surfaces using two different experimental approaches. In the first case the instrument consists of a pair of hemispherical analyzers which are operated with continuous primary beams of electrons or photons. The second instrument employs a pair of time-of-flight spectrometers which require a pulsed excitation source. A key experimental quantity is the ratio of 'true' to 'random' coincidences which can be determined in different ways. Regardless of the type of instrument the primary flux has to adopt a much smaller value than in single electron spectroscopy. We describe different approaches to obtain the relevant count rates, in particular the concept of operating with a delayed coincidence circuit. We also address the question on how to compare the two types of spectrometer in terms of their performance. This paper reviews our contributions and the development of an instrument for X-ray photoelectron diffraction (XPED) and X-ray holography. XPED and X-ray holography have been extensively applied in materials analysis over the past decades. We made pioneering contributions in this area that fueled the development of the corresponding instrumentation and technology. In this review, we

briefly discuss the theory of XPED and X-ray holography instrument, the genesis, and applications. The instruments comprise a high-power soft and hard X-ray source as well as a diffraction aperture; further, they are capable of high-angular-resolution detection and patterning. The applications of these instruments for practical surface analysis are also reviewed for ultrathin insulators, catalysts, and magnetic materials. Finally, possibilities for the differential photoelectron holography (DPH) approach are premiered based on a novel approach.

### Multi-Configuration Dirac-Fock

The paper presents numerically calculated models of new electrostatic energy analyzers based on a conical face-field, which is restricted by concentric cylindrical (inner) and truncated-cone (outer) electrodes and two flat boundaries, perpendicular to the axis of symmetry. The calculated analyzers show good enough as energy resolution as well the acceptance characteristics, simple design (without fringing fields) and provide wide abilities for analyzing surfaces of remote objects of different shape and size. Remote sensing allows use in various applications when is desirable to use a set of methods without mutual interference, what is useful tool's characteristic for investigating nanostructures. We present excitation energies, wavelength of emitted photon during the transition from upper level to lower level, transitions rates and other transition parameters for doubly excited states of W LXXIII and Au LXXVIII by employing Multi-Configuration Dirac-Fock (MCDF) scheme with the inclusion of relativistic effects. We endorse that contribution of QED and Breit corrections in energies of levels is significant. We have also shown that our results of energies from both, FAC and GRASP matches with each other. We have predicted that 37 Hard X-ray (HXR), 25 Soft X-ray (SXR) and 20 Extreme Ultraviolet (EUV) magnetic dipole (M1) transitions among relativistic levels generated from doubly excited states in W LXXIII and Au LXXVIII. Further, we have studied the convergence in excitation energies and lifetime of excited states and analysed the improvement in accuracy of results by estimation of uncertainty percentage in line strength. Besides, fresh atomic data of W LXXIII and Au LXXVII which is not published in the literature have been reported and can be advantageous in diagnosis and modelling of fusion and astrophysical plasmas.

Based on both, ab-initio cluster calculations as well as

periodic density functional based loss function calculations, we have assigned the origins of the valence electron excitation regime in electron energy loss spectra of well-ordered ceria films in (111) orientation at various states of reduction as well as after exposing the reduced films to hydrogen from the gas phase. The explicit calculation of intensity distributions using the dipole approximation allows us to draw conclusions about the nature of oxygen vacancies, which occur upon reduction and how those interact with hydrogen to form hydride species. The present study also reports a brief discussion of vibrational excitations of hydrogen loaded ceria and corroborates previous interpretations, based on inelastic neutron scattering. Angle-resolved photoemission spectroscopy (ARPES) is the key momentum-resolved technique for direct probing of the electronic structure of a material. However, since it is highly surface-sensitive, it has been applied to a relatively small set of complex oxides that can be easily cleaved in ultra-high vacuum.

Brookhaven National Laboratory (BNL) in which an oxide molecular beam epitaxy (OMBE) is interconnected with an ARPES and a spectroscopic-imaging scanning tunneling microscopy (SI-STM) module. This new capability largely expands the range of complex-oxide materials and artificial heterostructures accessible to these two most powerful and complementary techniques for studies of electronic structure of materials. We also present the first experimental results obtained using this system the ARPES studies of electronic band structure of a  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$  (LSCO) thin film grown by OMBE.

Here we describe a new multi-module system at