Project Title*:	**When Molecules Meet at Surface: A Renovated Model at Redox Interface**
Name of Supervisor*:	Dr Kuang-Hsu (Tim) Wu
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Name of Joint/Co-Supervisor*:	A/Prof. Da-Wei Wang
Email of Joint/Co-Supervisor*:	da-wei.wang@unsw.edu.au
Faculty Research Area (Theme)*:	Energy Systems, Renewable and Non-Renewable
School Research Area*:	Energy
Applicable to other Engineering schools/disciplines:	Sciences – Maths, Physics, Chemistry
Abstract*:(Maximum 200 Words)	As core to new electrocatalysis science (an important branch of renewable energy conversion), analytical methods are the cornerstones to all new discoveries. Electrochemistry is first used as a high-precision analytical tool and evolved to become a reaction platform for catalysis. However, the impetuous transition did not allow full integration of key physical chemistry concepts in the methods, for example, most electroanalytical methods omit the presence of chemical interaction at the discrete double layer. The approach is time-effective, but at the cost of missing important information for understanding the very process of catalysis. In this short project, you will appreciate how mathematics and modelling can be a useful tool for practical method development. You will learn the basic electroanalytical chemistry, develop a new analytical tool, and proof-the-concept in an actual experiment. (This project will require a sound physical chemistry background and level 1 mathematics (simple calculus and linear algebra)).
Research Environment:(Maximum 100 Words)	PartCat Group is a leading group in clean energy technologies. Our research aims at providing a solution to global energy issue. We have fully equipped research facilities and the student will be working in an active environment led by world-class researchers. This is an ideal setting for the student to learn and work with different instruments in a multi-disciplinary research environment. The project will be supervised by Dr Kuang-Hsu (Tim) Wu and in conjunction with Prof. Rose Amal and A/Prof. Da-Wei Wang.
Novelty and Contribution:(Maximum 100 Words)	Electrical double layer is a well-known concept regarding solution and electrochemistry. However, in modern electro-analytical methods, such as rotating ring-disc electrode voltammetry, there still employs a single-layer and assumes 100% reaction on site, disregarding adsorption and interaction within double layer region. Using mathematical kinetic modelling, a physical model of a redox reaction course will be created with capacity for quantitative analysis in actual experiment. The new analytical tool will enable further insight and better integration of analytical power into electrocatalysis research, particularly at providing interfacial interaction and better understanding of the physical processes.

Expected Outcomes:(Maximum 100 Words)	The project will allow students to appreciate the principles of electroanalysis, and to develop an innovative solution to a real-world problem. Putting mathematics skills into practice will prepare students to better utilize their analytical minds. The student will be trained from electrochemistry knowledge to practical electroanalytical skills and data analysis, preparing the student with the techniques required for future career. A publication is expected out of the research in a peer-reviewed journal for the mutual benefit of all parties.
Reference Material Links:(Maximum 100 Words)	[1] Nature Materials 2013, 12, 101-102. [2] ChemElectroChem 2016, 3, 622-628.
Will the student visit the premises of an industry partner, or undertake any activity on premises external to UNSW?*	No
Terms in which project can commence:	Term 2 Term 3