תכנית האנרגיה ע"ש גרנד מתכבדת להזמינך להרצאות סמינריוניות שתינתנו ע"י:

עופר רוזנט

במסגרת עבודת מחקר לתואר מגיסטר בהנחיית: פרופ' גדעון גרדר, הפקולטה להנדסה כימית ע"ש וולפסון, דר' גנדי שטר, הפקולטה להנדסה כימית ע"ש וולפסון

Electrospinning and thermal processing of PZT nanofibers mats for energy applications

The demand and production of small scale electronic devices is constantly growing. All these devices require individual, miniature and long term power sources. Usage of conventional batteries is limited due to their large size, short shelf life and frequent maintenance requirements. Piezoelectric materials can directly harvest energy from the environment by transforming mechanical energy into electrical one. PZT based ceramics are known for their superior piezoelectric properties, making them an optimal choice for energy harvesting applications. It is suggested that PZT materials prepared in the form of nanofibers mats can be integrated to the power chain of small scale devices. Thus the main objective of the research is the development of simple, efficient and low cost fabrication process for PZT nano-fibers mats using electrospinning. The mats need to be heated to form the piezoelectric phase. However it was found that during heating, the electrospun mats undergo large shrinkage (~50%) and undesirable and uncontrolled deformation. The fiber deformation was studied and an optimal thermal treatment was developed. In addition, the effect of raw materials on the deformation was studied. The presentation will discuss the preparation of desired sintered flat PZT fiber mats.

צביה רדלאור

במסגרת עבודת מחקר לתואר מגיסטר בהנחיית: פרופ"ח יועד צור, הפקולטה להנדסה כימית ע"ש וולפסון, פרופ' אילן ריס, הפקולטה לפיסיקה

Electrical Characterization of the Active Cathode Area in Solid Oxide Fuel Cells

Fuel cells are an attractive prospect due to their ability to convert chemical energy to electrical energy when supplied with fuel and oxygen with high efficiency. Solid oxide fuel cells (SOFCs) are of particular interest due to the flexibility in the type of fuel and catalysts that may be used. The performance of SOFCs is limited by the cathodic reaction, which requires adsorption and dissociation of oxygen gas on the cathode surface and diffusion of the adsorbed atomic oxygen to the active electrode area, where it is caught by an oxygen vacancy in the electrolyte together with two electrons. When the cathode is a poor ionic conductor, the active electrode area is limited to the triple phase boundary (TPB) between the gas, electrode and solid oxide electrolyte phases.

The objective of this study is to develop and demonstrate a direct electrochemical technique of determining the cathodic triple-phase boundary (TPB) between electrode, electrolyte and gas phase. A novel method is used in which the surface resistance between interdigitated electrodes is measured while under cathodic polarization versus a third counter electrode.

The three-electrode measurements are performed as follows: the electrical impedance between two interdigitated gold electrodes on a YSZ solid electrolyte is measured while at the same time driving dc current between one of the gold electrodes and a silver counter electrode. Impedance spectroscopy (IS) and cyclic voltammetry (CV) measurements are performed at temperatures of $250^{o}C$ - $300^{o}C$. The sign and magnitude of the applied dc bias as well as the spacing between the interdigitated electrodes are varied and the effect on the IS and CV measurements is examined. IS results demonstrate two main features – a large low-frequency (LF) arc and a smaller high-frequency (HF) arc.
The LF arc reflects the electrochemical process at the gold electrodes, and the HF arc reflects the impedance of oxygen ion motion in the electrolyte between the two interdigitated electrodes. CV results show hysteresis and decreasing resistance with increasing dc bias, consistent with the IS results. The high frequency arc shows a change in the impedance while applying a high dc bias (>1V) for cathodic polarization, indicating that the TPB is then becoming significant. The effect is more pronounced when the distance between the interdigitated electrodes decreased. The dc bias significantly also affects the low frequency arc but this can be either due to a change in the TPB or due to exponential I-V relations.

ההרצאות יתקיימו ביום ד' 29.7.15, ויחלו בשעה 11:00 באולם 6, בניין הפקולטה להנדסה כימית ע"ש וולפסון.