Project proposal template – Faculty studentships Summer 2014

Project title	Novel Organic Semiconductors	*Director of Study*	Richard Singer
Second Supervisor	Prof Peter Foot	*School*	Pharmacy and Chem
Other members of supervisory team	Prof Peter Spearman	*Any requirements from applicant (eg degree in specific subject area)*	Chemistry preferred other physical molecular sciences may be acceptable

Project summary

(max 1,000 characters)

Organic field-effect transistors (OFETs) are exciting new electronic devices with applications in smart cards, electronic ID tags, sensors and TV screens. OFET circuits have advantages over inorganic ones: they can be made at low temperatures, on flexible substrates and at low cost. There is scope for new organic devices, such as chemical sensors, solar cells and lasers.

At Kingston we have produced new ladder-structure (L) semiconductors, including a 5-ring oligomer $L5H_2$, 7-ring $L7H_2$, 9-ring $L9H_2$ and a high polymer. Prototype OFETs have been prepared. $L5H_2$ is similar in structure to the commercial semiconductor pentacene, but is much easier to synthesise and more stable.

In this project, OFETs and new solar-cell devices will be made from $L5H_2$ and $L7H_2$ and studied by current-voltage and photoelectric measurements. The effect of processing on the materials properties will be correlated with structural changes revealed by electron microscopy and x-ray diffraction. Computer modeling will be used to predict and rationalise the trends in the bandgaps and optical spectra of the oligomers and to design new compounds, using molecular orbital software (eg Gaussian, Scigress, GAMESS).