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Organic Polymers for Photovoltaic Application: a Theoretical Approach in the Design of Materials

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The production of clean source of energy is one of the important challenges that our society is facing. One way to achieve it is to use the sunlight and to convert it into usable energy, a process which is realized in photovoltaic devices. Nowadays, commercially available photovoltaic devices are made of silicon. Because large amount is needed, it makes devices based on this material relatively expensive which is the main factor that limits the widespread use of this technology in energy production.

An alternative approach would be to use organic compounds in photovoltaic devices, in particular polymers. Polymers would have many advantages over silicon: greatly cheaper to produce, can cover large area, light weight, and hopefully recyclable. However, presently, the polymers used are not very efficient to convert the sunlight into energy, they are roughly half as good as the traditional silicon device. The search for better photovoltaic polymers is very active, and ab initio calculations can help in this pursuit by assessing potential polymers and evaluate their value even before they are synthesized. In this presentation, I will discuss the important electronic proprieties needed for polymers used in photovoltaic devices and illustrate how ab initio calculations can help design even better polymers.

Professor Côté obtained a B.Sc. with Honours in Physics from Concordia University, option Science College in 1993. He continued his studies at the University of California, Berkeley where he completed a Ph.D. in 1998. From 1998 to 2000, he was a Research Fellow at the Cavendish Laboratory, Cambridge University, England. He returned to Québec in 2000 to take on a Professor position at the Université de Montréal in the Physics Department. He received the Centennial NSERC scholarship for his Ph.D studies and an NSERC postdoctoral fellowship. As well as pursuing his Professor and research duties, he is the site leader for the Réseau québécois de calcul de haute performance at the Université de Montréal.