平成 28 年 2 月 17 日
応用物理学会北海道支部
会員各位

応用物理学会北海道支部講演会のお知らせ

下記講演会を開催いたしますので、多数ご参加下さいますようご案内申し上げます。

演題：Nonlinear optical nano-photovoltaics
講師：Prof. Jean-Michel Nunzi 氏
（Department of Physics, Engineering Physics and Astronomy, Department of Chemistry, Queen's University, Kingston Ontario, Canada）
日時：平成 28 年 2 月 29 日（月） 14:00～15:00
場所：千歳科学技術大学理工学部研究実験棟 D209
主催：応用物理学会北海道支部（共催団体：千歳科学技術大学フォトニクス研究所）

講演の要旨

A photovoltaic (PV) technology that is not limited to the Shockley-Queisser efficiency limit and that is amenable to low-cost and large-area production requirements is studied in our team. It does not rely on the photoelectric effect, which is at the origin of the efficiency limits of the PV effect in semiconductor devices, it uses optical rectification of sunlight as a concept for high efficiency PV cells. Antennas efficiently convert waves into a potential difference, which must be rectified to DC or low frequency current to be useable for energy production. This particular type of antenna was named rectenna. EM-wave to DC conversion can in principle be done at solar frequencies with much higher conversion efficiency (85%), than present day photovoltaic technologies. The idea of collecting solar EM-radiation with rectennas was proposed forty years ago, but suffers that rectification should be achieved at optical frequencies where diodes don't exist. We proposed a practical design in which light rectification is achieved by metallic nanoantenas covalently coupled to molecular diodes. We started this project investigating nonlinear absorption in a poly (3-hexylthiophene) (P3HT) PCBM fullerene blend, one of

the most popular organic solar cell’s materials. The output photocurrent of the photodiode was interpreted in terms of the three-photon absorption properties of the P3HT:PCBM blend at 1550 nm. Could the concept be extrapolated to high efficiency solar cells? We review some essential phenomena happening in nanostructured organic solar cells and how they may limit their efficiency. We then show how the optical antenna technology revisited with plasmonics and organic rectifiers should permit the development of an ultra-high efficiency PV technology that is compatible with large-area fabrication (self assembling) and low-cost (plastic) technologies. We discuss its relation-ship with second and higher-order nonlinear optics.

世話人　川辺　豊
千歳科学技術大学　理工学部
電話：0123-27-6067　y-kawabe@photon.chitose.ac.jp