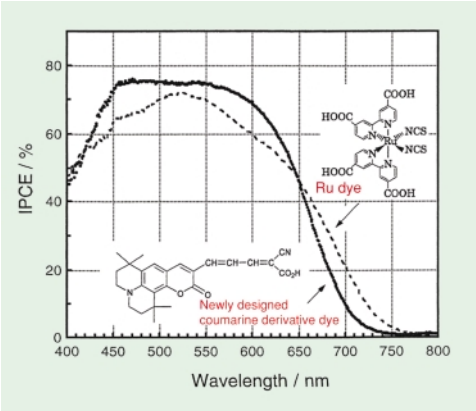
Energy Science & Technology

Development of New Organic Dye Sensitized Solar Cells

The new efficient organic dye sensitized solar cell was developed. In order to harvest light widely in a visible region and to obtain an efficient electron injection form dy e to oxide semiconductor photoelectrode, newly designed coumarin derivatives were synthesized. It was found that a newly designed coumarin derivative dye shown in Fig.1 works as an efficient photosensitizer for TiO2 nanocrystalline solar cells. The highest solar light to electricity conversion efficiency such as 6.0% with 14.0 mA/cm2 (Jsc), 0.60V (Voc) and fill factor of 0.71 was obtained under standard AM1.5 irradiation (100mW/cm2).



Incident photon to current conversion efficiency (IPCE) of newly designed coumarine derivative dye- and Ru dye(N3 dye)-sensitized solar cells

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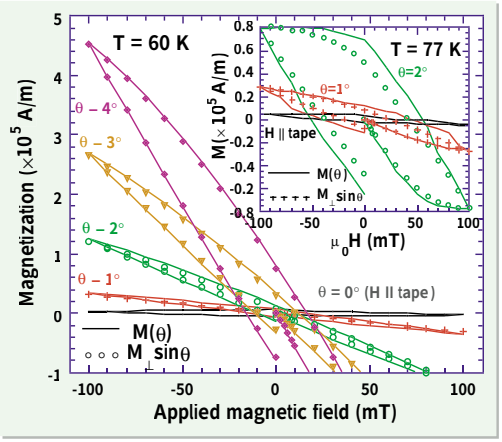
Hysteresis Losses of Superconducting Tape Conductors in Nearly Parallel Magnetic Fields

In order to elucidate the hysteresis loss behavior of the next-generation superconducting wire, we investigated magnetization hysteresis loops of micron-thick $YBa_2Cu_3O_7$ films deposited on Ni-based alloy tapes in magnetic fields applied nearly parallel to the film surface. We measured the magnetization perpendicular to the film, and confirmed that it is the dominant contributor to the hysteresis loss (area of the hysteresis loops), unless the field is oriented very close to the film surface. We found that its effect on the hysteresis loss is more significant at higher temperatures (T ≥ 77 K) at which the critical current density becomes lower.



Angular dependence of magnetization of a YBCO tape, measured every 1° near the H II film at T = 60 K. Solid lines denote the measured magnetization data and markers denote the contribution of the perpendicular magnetization. The hysteresis loss increased remarkably with angle at 77 K (inset).

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