Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Thermopower of a Quantum Dot in a Coherent Region TAKEO KATO, ISSP, University of Tokyo, TAKESHI NAKANISHI, AIST, Japan — Thermoelectric power can provide useful information on electron transmission processes. Recently, thermoelectric power of quantum dots made in two-dimensional electron gases and carbon nanotubes has been measured by several groups, and compared with the theory based on sequential-tunneling and co-tunneling. It, however, remains an unsolved problem to study how electron coherency during transmission affects the thermoelectric power. In this presentation, thermoelectric power due to coherent electron transmission through a quantum dot is theoretically discussed. In addition to the known features related to resonant peaks, we show that a novel significant structure appears between the peaks. This structure arises from the so-called transmission zero, which is characteristic of coherent transmission through several quantum levels. It has also been shown that these structures are sensitively suppressed by weak phase-breaking, and that the calculated thermoelectric power coincides with the co-tunneling theory for sufficiently large phase-breaking. It has been proposed that, due to sensitivity to phase breaking, thermoelectric power can be used to measure electron coherency in a quantum dot. We also present the improved Mott formula, which can reproduce correct results for arbitrary transmission probabilities. (Reference: T. Nakanishi and T. Kato: cond-mat/0611538.)

Takeo Kato
ISSP, University of Tokyo

Date submitted: 21 Nov 2006 Electronic form version 1.4