Nature Materials, the researchers prepared a multiple-quantum-well structure consisting of 100 CdTe layers 58 Å thick separated by 19-Å MnTe barriers. The Mn^{2+} impurity ions, present at ~0.5% doping levels, were not introduced into the CdTe intentionally, but diffused from the barrier layers. Photoluminescence (PL) as well as PL excitation and Raman scattering spectra were acquired by using a CW Ti:sapphire laser. An additional mode-locked Ti:sapphire laser emitting subpicosecond pulses was used to obtain the time-domain reflectivity data and generate the exciton states. The resonant Raman spectra show spin flip (SF) transitions of electrons bound to donors and to the Mn ions. The Mn spectrum exhibits a series of peaks at multitudes of the fundamental paramagnetic resonance.

The researchers were able to create entangled states by selectively irradiating the quantum-well structures with light pulses of central energy at 1.677 eV. The signature of entanglement was the observation of overtones of the SF transition in the coherent time-domain spectra. Specifically, their data reveal the first and second SF harmonics implying the existence of entangled states that involve three donor impurities. Their results also show indirect evidence of two Mn ion entanglement. Because exciton generation can be tuned by varying the wavelength of the exciting light, this system can in principle be used to generate and precisely control multiple sets of entangled states for an arbitrarily large number of impurities.

GREG KHITROV

GaAs Quantum Dots Exhibit Triggered Single Photon Emission

Materials capable of emitting Fourier transform limited single photons are needed for quantum computing and quantum cryptography schemes. Semiconductor quantum dots are attractive single photon emitters but usually operate far from the Fourier transform limit. As reported in the April 7 issue of *Applied Physics Letters*, a team of researchers from CNRS, Alcatel R&I, and CEA in France has recently observed single-photon emission from quantum dots formed at interface fluctuations of GaAs/GaAlAs quantum wells (see figure). The researchers indicate that the quantum dots have potential as a source of Fourier transform limited single photons.

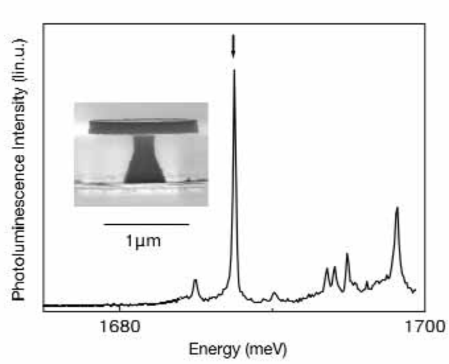

Figure. Microphotoluminescence spectrum measured in a 1-μm-diameter microdisk. The arrow points to the quantum-dot line selected for the photon correlation measurements. Inset: Image of a microdisk obtained by scanning electron microscopy.

The group used molecular-beam epitaxy to grow the sample, which included a single 3-nm GaAs quantum well surrounded by 50-nm $Ga_{0.67}Al_{0.33}As$ barriers. Quantum dots resulted from fluctuations in the thickness of the narrow well. Electron-beam lithography and chemical etching were used to cut microdisks from the sample, isolating several quantum dots. After measuring the emission spectrum of the isolated dots at 10 K and selecting a spectral line corresponding to an exciton transition, the team carried out photon correlation experiments using a Ti:sapphire laser delivering 1.5 ps pulses at an 82-MHz pulse repetition rate (i.e., 12.2 ns between pulses). Time intervals between successive photons were recorded. Emissions were largely in the form of single photons, separated by 12.2 ns (the time between laser pulses) with only a small probability of photon pair emission. The researchers said that, "compared with the coherent light pulses delivered by an attenuated laser, the probability of emitting a pair of photons is reduced by a factor of five."

The ability of GaAs quantum dots to emit single photons has not been demonstrated before. In particular, these recent results show that no significant refilling of the quantum dot from the reservoir of charge carriers in the nearby quantum well occurs once a photon has been emitted. The radiative lifetime of GaAs quantum dots occurring at quantum-well interfaces can be 50× shorter than the more commonly studied InAs quantum dots, making the former much less sensitive to decoherence processes and more likely to operate near the Fourier transform limit.

According to team members Jacqueline Bloch of CNRS and Jean-Michel Gérard of CEA, "Our next goals will be to probe precisely how close we are to the Fourier transform limit and to insert such quantum dots in a pillar microcavity." This insertion could allow emission of single photons even nearer the Fourier transform limit, with controlled mode and polarization, bringing GaAs quantum dots closer to application in quantum information technologies.

CATHERINE OERTEL

News of MRS Members/Materials Researchers

Lynn Boatner, a corporate fellow at Oak Ridge National Laboratory, has received the **Frank H. Spedding** Award in recognition of his research on the fundamental properties and applications of rare earth phosphates and other rare earth materials. The award was presented last year during the Rare Earth Research Conference in Davis, Calif.

Long-Qing Chen, professor of materials science and engineering at The Pennsylvania State University, has been awarded the University's **Faculty Scholar Medal** in engineering for his work in the area of computational materials science.

Sang-Hee Cho of Kyungpook National University, Daegu, Korea, has been elected to the **World Academy of Ceramics**.

Manish Chhowalla has joined the Department of Ceramic and Materials Engineering of Rutgers University from Cambridge University, in order to contribute to a growing multidepartment commitment to research and education in nanotechnology. Chhowalla focuses on thin films and the fabrication of new types of nanomaterials for electronic, mechanical, and optical applications.

Bruce Dunn of the University of California, Los Angeles, has been named holder of the **Nippon Sheet Glass Company Chair in Materials Science**.

Paul S. Follansbee has been selected as the new director of the Los Alamos National Laboratory's Materials Science and Technology Division. Follansbee suc-