Submitted: 21 December 2019
Accepted: 27 March 2020
Published Online: 16 April 2020

# Hypergiant spin polarons photogenerated in ferromagnetic europium chalcogenides

Appl. Phys. Lett. **116**, 152402 (2020); https://doi.org/10.1063/1.5143311

X. Gratens[1], Yunbo Ou[2], J. S. Moodera[2,3], P. H. O. Rappl[4], *and* A. B. Henriques[1,a)]

View Affiliations
View Contributors

## ABSTRACT

We find that in the ferromagnetic semiconductor EuS, near its Curie temperature, a single band edge photon generates a spin polaron (SP), whose magnetic moment approaches 20 000 Bohr magnetons. This is much larger than the supergiant photoinduced SPs in antiferromagnetic europium chalcogenides, reported previously. The larger SP in ferromagnetic EuS, and still larger expected for EuO, is explained by a larger Bohr radius of the photoexcited electron state, which encircles and polarizes a greater number of lattice spins. However, because the wave function of the photoexcited electron spreads over a greater volume, the photoexcited electron's exchange interaction with individual lattice spins weakens, which makes the SP more easily quenched thermally.

This work was funded by CNPq (Project Nos. 303757/2018-3 and 420531/2018-1), FAPESP (Project Nos. 2019/02407-7 and 2019/12678-8), the National Science Foundation (NSF-DMR No. 1700137), the Office of Naval Research (No. N00014-16-1-2657), and the Center for Integrated Quantum Materials (No. DMR-1231319).

Username:

Password

Remember me

LOG IN

Forgot password?

## INSTITUTIONAL ACCESS

Access through your institution

## PURCHASE

Standard PPV for $35.00

ADD TO CART

Resources

AUTHOR

LIBRARIAN

PDF | CHORUS