



TECHNISCHE UNIVERSITÄT
CHEMNITZ

Institut für Physik Physikalisches Kolloquium



Photo: A. Günther /FSUJ

Mittwoch, 12.06.2019, um 16:00 Uhr
Ort: Reichenhainer Str. 90;
Zentrales Hörsaal- und Seminargebäude,
Raum 2/N013

Prof. Dr. Heidemarie Schmidt

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Electroforming-free reconfiguration of BiFeO₃ and YMnO₃ switches for hardware security and neuromorphic computing

Memristor technology will strongly influence the architecture of computer systems in the near future. Its potential in several application domains, e.g. in-memory information processing [1], neuromorphic computing [2], hardware cryptography [3], and machine learning makes it more than ever necessary to understand the underlying resistive switching mechanisms and to look for electroforming-free memristors.

We have developed an electroforming-free bipolar and an electroforming-free unipolar memristor, namely BiFeO₃ and YMnO₃, respectively. Impedance data analysis and quasi-static test measurements on BiFeO₃ [4] with mobile oxygen vacancies and substitutional Ti donors on Fe lattice sites reveal that the field-accelerated ion mobility constitutes a source of ultra-nonlinearity and that the redistribution of oxygen vacancies during the writing step causes a nonvolatile reconfiguration of the barrier height of the top and bottom electrode.

Temperature dependent transport measurements on YMnO₃ [5] with vortex states reveal that the density of vortex states is changed during the writing step. A large and small concentration of vortices sets the YMnO₃ into low resistance state and high resistance state, respectively. We discuss how electroforming-free memristors can be exploited for hardware cryptography and neuromorphic computing.

- [1] You et al., Adv. Funct. Mat. 24, 3357-3365, 2014.
- [2] Du et al., Front. Neurosci. 9, 227, 2015.
- [3] Du et al., J. Appl. Phys. 115, 124501, 2014.
- [4] Du et al., Phys. Rev. Applied 10, 054025, 2018.
- [5] Rayapati et al., Journal of Applied Physics 124, 144102, 2018.

Alle Zuhörer sind ab 15:45 zu Kaffee und Tee vor dem Hörsaal eingeladen.

Informationen zum Vortrag erteilt:
Prof. Dr. Sibylle Gemming, Tel. 0351 2602470



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