

Ruthenates with Large Magnetoresistance

New materials with large magnetoresistive effects

Inventor
[I-Wei Chen](#)

STATE OF DEVELOPMENT

- Laboratory prototype

INTELLECTUAL PROPERTY

- US Patents 7,211,199 & 8,652,347

REFERENCE MEDIA

- Mamchik & Chen. (2003). Large magnetoresistance in magnetically frustrated ruthenates. Applied Physics Letters 82, 613.

APPLICATIONS

- Resistance switching nonvolatile memory

DESIRED PARTNERSHIP

- License

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Ryne DuBose
rdubose@upenn.edu
215-746-8107

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Problem

Magnetoresistive materials can change their electrical resistance when subject to an applied magnetic field. This property can be used for non-volatile resistance switching memory in which high and low resistance states are used to encode data. A similar effect called EPIR (electric-pulse induced resistance) can be used to change material resistance with electrical pulses. To easily utilize such materials in electronics, nontoxic substances are needed that can easily be integrated with modern semiconductor processing.

Solution

Researchers at the University of Pennsylvania have developed ruthenate materials that exhibit large magnetoresistance and electric pulse induced resistance switching effects. These ruthenate formulations from the perovskite family are shown to have a magnetoresistive effect of 18% or more when a magnetic field is applied. These materials can exhibit both MR and room-temperature EPIR effects. The family of ruthenate materials are non-toxic and compatible with CMOS processing, which could make them very useful for MR or EPIR based resistive memory devices.

Advantages

- Large magnetoresistance and electrical pulse induced resistance
- Non-toxic compositions

