

# Smart Fluid

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## 1. Theme description

A smart fluid, also called electro rheological fluid<sup>[11]</sup>, is a liquid suspension of metals or zeolites which solidifies when electric current is applied to it, becoming fluid again when the current is removed.

Smart fluids can be divided in four main classes:

- electro-rheological (ER) fluids<sup>[21]</sup>;
- magneto-rheological (MR) fluids<sup>[31]</sup>;
- magneto rheological elastomer (MRE) fluids<sup>[41]</sup>;
- electro-conjugate liquids<sup>[51]</sup>.

Since 1960, the engineers tried to develop new devices based on ER smart fluids (vibration damper, flow control waves, etc.), without important results. The turning point was there in 1990, after the discovered of MR smart fluid: indeed, in 2002, suspension damping struts of the Cadillac Seville STS model automobile (based on smart fluids) was discovered<sup>[61]</sup>.

The interest for this kind of technology is considerable and the perspective for a new device based on smart fluids is real.

In the following, a review on smart fluids, with future developments in the close future, is reported.

[\[1\]](#)

<http://www.businessdictionary.com/definition/smart-fluid.html>

[\[2\]](#) w. m. winslow: J. Appl. Phys., 1949, 20, 1137 – 1140

[\[3\]](#) j. rabinow: AIEE Trans., 1948, 67, 1308 – 1315

[\[4\]](#) B. X. Ju, M. Yu, J. Fu, Q. Yang, X. Q. Liu, and X. Zheng, "A novel porous magnetorheological elastomer: preparation and evaluation," Smart Materials and Structures, vol. 21, no. 3, Article ID 035001, 2012

[\[5\]](#) W.-S. Seo, K. Yoshida, S. Yokota, and K. Edamura, "A high performance planar pump using electro-conjugate fluid with improved electrode patterns," Sensors and Actuators A: Physical, vol. 134, no. 2, pp. 606–614, 2007

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