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A contribution about ferrofluid based apedal locomotion

ABSTRACT

Ferrofluids are superparamagnetic suspensions, whose surface contour and/ or pressure can be modified with electromagnetic fields. This property allows its controlled movement, which can be used to develop novel locomotion systems.

The poster presentation refers to design proposals and characteristics of ferrofluid based apedal locomotion systems. Thereby potential functional locomotion principles will be classified and a theoretical and experimental description of those will be offered using selected implemented models.

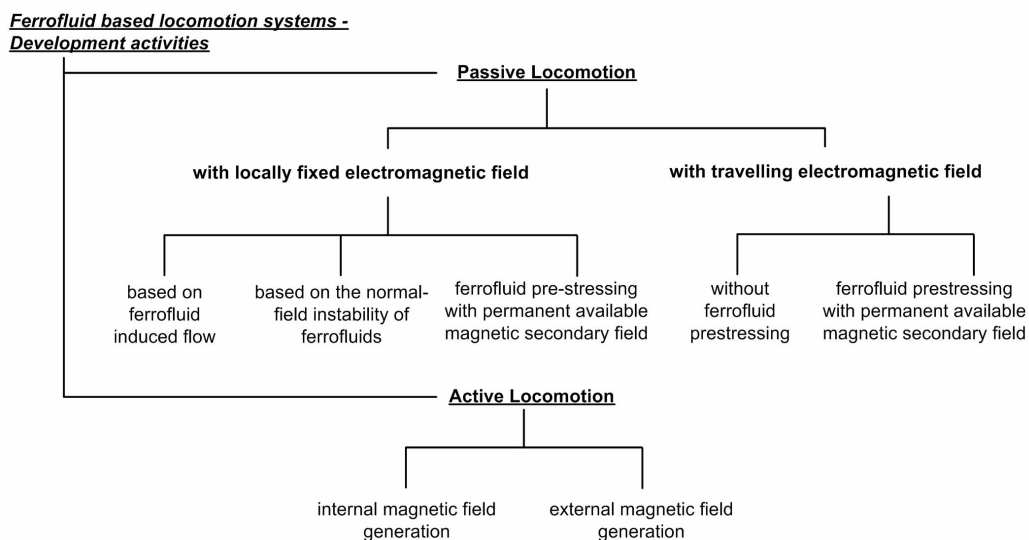


Figure 1: Development activities on ferrofluid based locomotion systems

Two types of systems will be regarded – active (global change of the ferrofluid position together with the moving system) (figure 2) [1] and passive ones. The latter one (local change of the mechanical properties of the fluid which affects the locomotion) is mainly focused on the locomotion on the free ferrofluid surface [2] (figure 3).

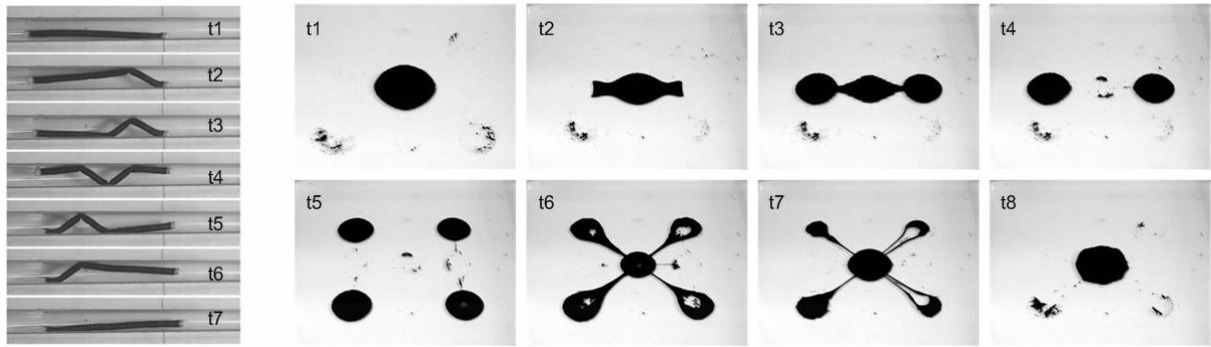


Figure 2: Examples for ferrofluid based active locomotion systems (left: snake like locomotion of a ferrofluid filled capsula; right: controlled movement of ferrofluid droplets)

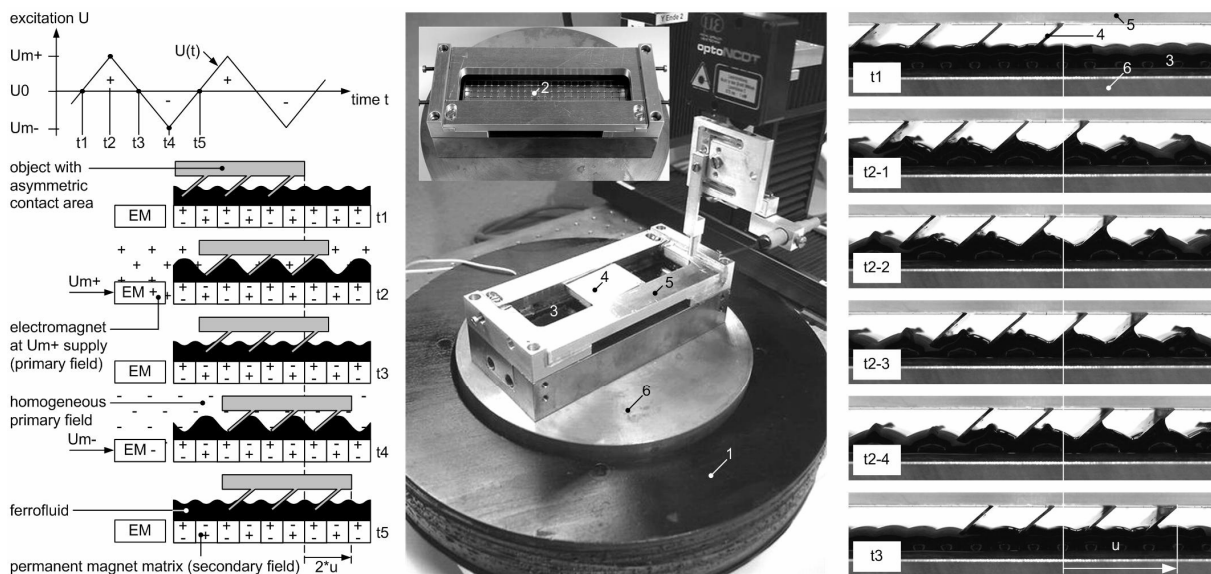


Figure 3: Example of a ferrofluid based passive locomotion system (left: functional schematic; center: experimental assembly - 1: coil, 2: permanent magnet matrix (+/-: opposing field directions), 3: ferrofluid, 4: non-magnetic object, 5: lateral guidance, 6: iron core; right: moving behaviour of the object for one half of an excitation periode)

References:

- [1] Zimmermann, K.; Naletova, V. A.; Zeidis, I.; Böhm, V.; Kolev, E.: Modelling of locomotion systems using deformable magnetizable media, Journal of Physics: Condensed Matter 18 (2006) S2973-S2983.
- [2] Zimmermann, K.; Böhm, V.; Zeidis, I.; Popp J.: Ferrofluid based locomotion system with locally fixed electromagnetic field Proc. of the ACTUATOR 08 - 11th International Conference on New Actuators and Drive Systems (2008), S834-837. (ISBN-3-933339-10-3)

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