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Magnetically assembled micro-porial valve system- A new valve system based on magnetic assembly for IC engines

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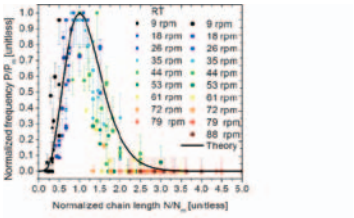
A study on the possibility of using magnetic self-assembly of PDMS into controlled micro-pores as a efficient valve system in an I.C engine.

LEVEL 1: Introduction: In this level of study we analyzed the efficiency of magnetic assembly of PDMS particles at varying angular rotation of planes in order to introduce the concept of turbulence of the medium into the system.

We used the simulation provided by Filip Ilievski[1], Madhav Mani[2], George M. Whitesides[1] and Michael P. Brenner[2]

The magnetic blocks are PDMS cubes, with small disk-shaped magnets embedded in the center of one face of the cube, with the north pole facing outward. A square prism of soft ferromagneticNiCu alloy is embedded on the opposite face. Two such cubes interact by lining up the permanent magnet with NiCu.



LEVEL 2: Realization

Using the model,we reached the following equations,

$$Q_N = q_t^{(N)} q_r^{(N)} (q_v e^{-V^*/k_B T_{eff}})^N,$$

The probability distribution requires computing the partition function QN for linear aggregates of size N; this decomposes to its translational (qt), rotational (qr), vibrational (qv) V* is the binding energy of two magnets to each other.

where the most probable configuration occurs at chainlength Nm:

$$N_m \sim -\frac{5k_B T_{eff}}{V^*}.$$

LEVEL 3: Practical compatibility and conclusion

We went to use the fully turbulent fluid problem with the magnetic assembly in order to obtain the full-fledged results. The above mathematical relations showed a higher degree of non-linearity which reduces the chaotic tolerance of the system. The working of the ECM will help to regulate the tolerance. We predicted two possible interactions with the pores-induction and slidation and quantitatively predicted the effect of both on the process.

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