

Noise Induced Phase Transitions and Coupled Brownian Motors: Non Standard Hysteretic Cycles

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Recent work¹⁻³ have shown the possibility, through a noise induced symmetry breaking leading to a nonequilibrium phase transition, of obtaining a set of coupled Brownian motors. It was also shown⁴ that in some parameter region such a system could show negative mobility (that is motion opposed to the applied force) and anomalous hysteretic behavior (clockwise in opposition to the usual counter-clockwise). Using an explicit mean-field approximation and colored multiplicative noises, it was found a contraction of the ordered phase (and re-entrance as a function of the coupling) on one hand, and a shift from anomalous to normal hysteretic behavior on the other⁵. This behavior was obtained in systems presenting a noise induced phase transition that originates from a short time instability. Here we discuss a similar system, but where the noise induced phase transition is originated in an entropic mechanism⁶. Some preliminary studies that exploits such a mechanism indicate

the possibility of obtaining no standard hysteretic cycles: anti-clockwise but showing a staircase-like structure. Depending on the parameter region, the hysteresis diagram could have one or more blocks, that can be explored as a whole or step by step, opening the possibility of exploiting it as a noise-controlled multipurpose logic gate.

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³ Mangioni et al, Phys. Rev. E **61**, 223 (2000).

⁴ Reimann et al, Europhys.Lett. **45**, 545 (1999).

⁵ Mangioni et al, Phys. Rev. E **66**, 051106 (2002).

⁶ Carrillo et al, Phys. Rev. E **67**, 04611 (2003).