OIL AND WATER MODEL ON VERTEX TRANSITIVE GRAPHS

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The oil and water model is an interacting particle system with two types of particles and a dynamics that conserves the number of particles, which belongs to the so-called class of Abelian networks. Widely studied processes in this class are sandpiles models and activated random walks, which are known (at least for some choice of the underlying graph) to undergo an absorbing-state phase transition. In this work we show that the oil and water model is substantially different from sandpiles models and activated random walks, in the sense that it does not undergo an absorbing-state phase transition and is in the regime of fixation at all densities. Here we summarize our main result.

Theorem 1. *Let the oil-water model be defined on an infinite, vertex-transitive graph of bounded degree, then for all initial densities*

$$\mathbb{P}[\textit{oil-water model fixates}] = 1.$$

References

[1] Elisabetta Candellero, Alexandre Stauffer and Lorenzo Taggi. Abelian oil and water dynamics does not have an absorbing-state phase transition. *Trans. Amer. Math. Soc.* **374** (2021) 2733–2752

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