

Existence and optimal decay for nonnegative  
solutions of a class of  $4^{th}$  order nonlinear diffusion  
equations

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**Abstract**

We discuss some recent results (in collaboration with U. Gianazza, G. Toscani, R.J. McCann, D. Matthes) on the existence of nonnegative solutions to a class of nonlinear  $4^{th}$  order evolution equations, arising in thin-films (with linear mobility) and in quantum-drift diffusion models. These equations exhibit an interesting variational structure in the so-called Wasserstein space of probability measures and some techniques of the metric theory of gradient flows can be valuably applied. The main advantage of this approach is twofold: nonnegative solutions are easily obtained even if a maximum principle is lacking and discrete/continuous entropy estimates can be derived by general principles. In particular, exploiting a strict link with porous medium equations, new optimal decay estimates can be proved.