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The "coffee-ring effect" as a way to remove pollutants and control drying rate in porous media EMMANUEL KEITA, PAMÉLA FAURE, STÉPHANE RODTS, Universite Paris-Est, Laboratoire Navier, France, DAVID A. WEITZ, Department of Physics, Harvard University, USA, PHILIPPE COUSSOT, Universite Paris-Est, Laboratoire Navier, France — Due to the transport of elements they induce imbibition-drying cycles are known to play a major role in the colloid-facilitated transport in soils and building materials. We study the drying of a colloidal suspension in a porous media. The critical physical phenomenon at work here is the displacement and redistribution of colloidal particles or ions induced by evaporation of the liquid phase from the porous medium. This can be clearly seen by filling a bead packing with coffee. Indeed after full drying the sample has shaded tones with darker regions around the sample free surface and white regions almost free of particles around the bottom. The mechanisms are not yet fully understood and there is no straightforward observation and simple quantification of the spreading of the elements. Using a new MRI technique to look at a complex porous media with colloidal particles in suspension in water we show that the drying of a porous medium filled with elements in the advection regime develops a specific coffee-ring effect. We can quantify how the elements migrate towards the free surface of the sample and accumulate in the remaining liquid films. Our complete understanding of the process makes it possible to establish a simple model predicting the drying rate and the concentration distribution. This opens the way to a control of salt or colloid transport and drying rate of soils and building materials.

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