



Recent advances in wetting, drying and coating processes

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1 Introduction

This special issue presents papers from the 15th biennial European Coating Symposium (ECS), which was held in Paris, France, on September 11–14, 2023. About 120 participants, including 7 Keynote speakers, from all around the world attended the ECS, which topics are at the crossroads of the physics of wetting, soft matter and coating processes, see the website <https://www.european-coating-symposium.eu/ecs.html> for more details of the previous symposia. It included 54 oral presentations in two parallel sessions, and 15 poster presentations. Furthermore, this event included a pre-conference training day with four general lectures especially targeting students and industrial attendees.

As for the previous events, the classical division between wetting, drying and coating, does not hide the fact that very different new subjects are emerging, a tendency that we have tried to encourage. The scopes include in particular timely subjects in soft-matter physics or hydrodynamics, like the dynamics of liquid wetting, the drying of suspensions, the stability of liquid thin films, the wetting of complex fluids or the spreading of liquids occurring with solidification. Besides fundamental studies, many talks presented original progress on energy, batteries, solar cells, fracture in art painting, soft matter compounds and materials, inkjet printing, glass industry and cosmetic films,... Exploring new fields is essential to maintain the dynamism of the event. Above all, the Symposium has been the occasion for many people and old friends to meet again. We have tried to make the event very festive with a cruise banquet on the Seine river, and a degustation of French wines and cheeses during the poster session.

This special issue of EPJ Special Topics collects 10 papers presented in this meeting, that reflect the diversity and dynamism of the event. We express our deep gratitude to all the authors for their contributions. Let us mention that all articles have undergone careful peer-review to make sure they meet the same high-standard quality as other papers in the journal.

We give hereafter a teaser of the different contributions. In Jee and Jung's paper [1], the intermittent generation of discrete coating patches is studied with numerical simulations, with a particular focus on the residual volume at the start and end edges showing a dependence on capillary number and on the shear-thinning properties. In the context of coating of battery electrodes, Hoffmann et al.'s paper [2] investigates the influence of viscosity contrast in a two-layer coating process. In Mauron et al.'s paper [3], the mechanical properties of a composite layer coated via dual inkjet printing of droplets of two polymers (soft and hard) are investigated in the context of mechanochromic materials. In Mohacsi et al.'s paper [4], the successive steps of the drying of a particle suspension layer on a solid substrate are monitored by light scattering, revealing a strong correlation between the scattered signal and the adhesion force of the layer. This study is followed by a second part [5], where the same drying stages of a suspension layer are investigated with confocal chromatic microscopy. In the paper by Scholle et al. [6], an analytical and numerical investigation of a two-layer coating flow on a periodic surface topography is presented, validating a Complex Variable method over a more classical lubrication approach. The influence of viscoelasticity on the dynamical contact-angles—including the entrainment transition—in a dip-coating geometry is investigated

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by Kansal et al. [7]. This analytical study, using a lubrication framework with slip length, together with a second-order fluid rheology, gives a prediction for the meniscus shape and dynamical angles for advancing and receding cases, in both the limits of small and large angles. In Kim et al.'s paper [8], the optimisation of the geometry of slot coating injectors by a machine-learning method is presented, with the successful objective to reduce the flow inhomogeneities at the slot exit. In Karimi et al.'s paper [9], an experimental study of the flow regimes in a film flow coating an overhanging substrate is presented, revealing convectively unstable behavior with the periodic formation of drops—susceptible to drip off the substrate in a range of flow-rate and inclination angle. Finally, Bintein et al. [10] present a review of unsteady dynamics in wetting and spreading, with a particular emphasis in periodically driven contact-lines in model experiments and the existing theoretical approaches to address this case.

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