# PIC-MC simulation study of rotational magnetron sputtering

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Dual rotatable magnetron sputtering sources are state of the art in large area coating technology and nowadays play an important role in deposition of precision interference coatings. For the latter, a precise uniformity control on flat as well as on curved moving substrates is mandatory. We present a simulation tool acting on multiple scales aimed to predicting and optimizing the film thickness profile: first, Particle-in-Cell Monte-Carlo (PIC-MC)simulations yield the relative sputter erosion profile at the cylindrical targets.With this input, a Direct Simulation Monte Carlo (DSMC) simulation of gas flow and transport of sputtered atoms allows for predicting the flux profile of sputtered material near the substrates. Based on laterally resolved angular distribution profiles of the material flux, a ray-tracing approach enables fast reproduction of the film thickness profile on curved substrates during dynamic deposition. The feasibility of this simulation approach is demonstrated on a dual cylindrical magnetron sputtering setup for optical precision coatings in comparison with experimental findings.