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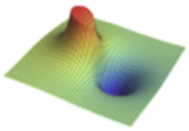

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Highly-resolved simulations of the dynamics of charged particle-laden flows using *pafiX*

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Last year we have publicly released pafiX, a new numerical tool for highly-resolved simulations of powder flows with the inclusion of models of specific importance for explosion protection. This approach enables the identification of fundamental mechanisms related to the interaction between turbulence and the dynamics of electrically charged particles. Through these simulations, it was found that particles migrate towards the wall through turbophoresis where they experience contacts and charging. Depending on the Reynolds number of the flow and the Stokes number of the particles, the concentration in the vicinity of the walls, and thus the probability of contact and charging, alter by up to two orders of magnitude. Also, the transport mechanism of the arising charge towards the bulk flow is determined by the underlying flow conditions. Once the particles accumulated charge, the emerging electric field significantly alters their flow pattern. In particular, charges attenuate vortical particle motion induced by secondary flows of Prandtl's second kind as they appear in square or rectangular ducts. When this motion is interrupted, the particles are driven to the corners and the walls of the duct. In this talk, I will present pafiX and an overview of the above-mentioned studies. Also, I will outline other research efforts at PTB related to electrostatics.

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