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Modeling & Simulation across P&G porous media based products

Abstract

Understanding and optimizing fluid flow and mechanical behavior for porous media is critical for developing superior consumer products, based on porous media, at Procter&Gamble, such as baby diapers, paper towels, wipes, feminine pads, packed bed filters for water, etc. This talk will provide first an overview of physics, modeling applications and challenges across a range of P&G products based on porous media. Then as a specific example the talk will provide an introduction into fluid flow in hygiene consumer products with the focus on baby diapers: in this case typical challenges are that the porous materials are soft and can deform due to wet collapse or external conditions, adjacent materials have a large contrast of key hydraulic parameters and they can be very thin such that the validity of the fluid flow equations is questionable. In addition, swelling of materials such as super-absorbers leads to dimensional changes of the pore structure during the fluid transport: we will share how the flow and deformation processes in swelling porous media have been modeled and how a finite element solution strategy has developed and implemented in the FEFLOW commercial simulator. As well the talk will highlight some examples of thin layers in hygiene products and establish a number of challenges associated with them.