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Shear-induced segregation of granular particles with different friction coefficients

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Segregation plays a major role in a large number of geological mechanisms, including sediment transport, bedsurface and bedload dynamics. Segregation induced by size or density difference of the particles was widely studied, but less attention has been given to the effects of surface friction of the particles. In the current study we address both experimentally and numerically the question of shear-induced segregation of a two component granular mixture, when the friction coefficients of the particles differ. For a system under gravity, we found both in the experiments and with the help of discreet element simulations that particles having a smoother surface tend to sink downwards. This is similar to the well described kinetic sieving of smaller or denser particles. In our case the smooth particles are more likely to fall into holes created by the shearing then the rough ones. Removing the gravitational field (simulations only) segregation persists and can be related to the distribution of the granular temperature in the system. Understanding the driving mechanisms may help us to better describe the more complex segregation patterns found in real life.