

# Tribo-electric charging for dry separation of food ingredients using electrostatic driving forces

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*Abstract*— Current wet fractionation of agro-materials into food ingredients involves copious water and energy consumption. Dry fractionation is a more sustainable alternative with the additional advantage that also functionality of the fractions produced are significantly retained. Conventionally, dry fractionation is carried out by milling followed by air classification or sieving. This PhD research is part of a larger project in which the ambition is to develop novel dry fractionation processes for concentrated particulate streams, relying on a.o. the use of electrostatic driving forces instead of particle size. Separation by electrostatics is achieved by first tribo-electrically charging the powder particles and then letting them migrate under the influence of an external electrostatic field. Tribo-electric charging behaviour of dry particles is critical to the effectiveness of the overall separation process. Therefore, this was investigated in more detail using well-defined particles made from polystyrene in combination with different aluminium charging tubes. The results gave better insight in the dynamics of the charging process, i.e. bulk charging behaviour of concentrated particulate streams as a function of a.o. particle size, concentration, gas velocity and humidity. Secondly, the charging behaviour and subsequent separation of food ingredient mixtures and industrially relevant feedstock were evaluated with a simple laboratory scale device (gluten/starch mixtures and wheat bran millings with particles size varying between 50 - 300  $\mu\text{m}$ ). The latter results provided valuable input to the final aim of the project, i.e. design and evaluate a semi-pilot device that can fractionate industrially relevant feedstock.