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Coffee powder wettability, flowability and characterization thereof

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ABSTRACT

The production efficiency and high-quality results in industrial processes usually rely on how well product characteristics are understood as well as how well processes are controlled in order to obtain specific results. Therefore, in a billion-dollar industry as is the case of the instant coffee market, understanding the properties of the compounds produced using different techniques is a very important tool to enhance performance and delivery of high-quality coffee powders. The aim of the present study is to provide a framework of some powder properties such as particle size, shape, diameter, circularity, convexity, aspect ratio and surface energy among others, which govern powder behavior. To do so, five coffee samples were analyzed using Malvern Morphologi 3G ID for particle characterization and QuantaTM 3D FEG scanning electron microscope to visualize surfaces in great detail. Wettability and flowability of all samples were studied under different humidity conditions. Afterwards, in an effort to enhance flowability, flow-enhancing agents were added to the samples that showed the worst flowability. The results revealed that while all the samples presented different particle size distributions, they showed similar circularity, convexity and aspect ratio values. Measurements indicated passable flowability for most of the powders. Even so, they revealed poor flowability and high values of angle of repose for the sample with finer particles as well as no significant improvement when adding flow-enhancing agents. Additional tests showed that at high relative humidity in the environment (RH=60%) wettability increased. This effect was observed as indicated by low contact angle values, thereby contributing to powder agglomeration and caking. The properties regarded throughout this study provide detailed information and allow the comprehension of the parameters that need to be modified in order to enhance performance and stability in the food industry.

KEYWORDS

Keywords, powder, wettability, flowability, particle size, roughness.