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Comet nuclei are considered to be composed of the debris and rubble from the early days of the solar system. Cometary dust grains will be analyzed in-situ in the vicinity of comet 67P/Churyumov-Gerasimenko in the years 2014/ 2015. The envisaged data of the secondary ion mass spectrometer instrument COSIMA will allow new insights into the cometary building blocks as derived from chemical composition, mineralogy and morphology analysis of the collected cometary dust grains. These grains have been modified prior and during the ejection and passage through the coma. We will discuss the various fractionation processes and their potential impact on the envisaged observational program of COSIMA onboard ROSETTA.