ABSTRACT

Fundamental tools of breakage were applied to investigate the breakage behaviour of a bed of silica particles which were subjected to multiple impacts. Experiments aimed at determining the effect of the grinding media diameter, drop height, bed height, input energy and specific energy on the resultant particle size distributions (PSDs) were performed using drop tests. The Attainable Region analysis tool was applied to determine the optimum production of an intermediate size class. In this context the AR is used more like a maximizing yield tool, as the goal is to determine the operating conditions that produce the most of an intermediate sized product, and mixing does not offer any advantage to milling alone. It was shown that different grinding media diameters produce different PSDs. The results show that there is a minimum amount of impact energy that needs to be reached in order for breakage to occur and an optimum impact energy in order to avoid overbreakage. It was proved that the specific energy is an extremely valuable parameter in analysing the breakage process and that for the same energy intensity, the resultant PSD is different. The results suggest that in a ball mill, one needs to use large grinding media (30 mm) and small grinding media (10 mm) in order to obtain more breakage and production of fines, respectively.