In-situ flow visualization and pressure fluctuation of concentrated alumina suspensions

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Concentrated suspensions show complex flow behaviors which are not observed in dilute suspensions. To analyze the complex flow behavior of concentrated suspensions in capillary flow, a conventional capillary rheometer (RH7, Malvern instruments) was modified using pressure transducer having high resolution and specially designed slit channel for flow visualization. In this study, in-situ flow visualization and in-situ pressure fluctuation measurement of concentrated alumina suspension (40vol%, pH 9.5) were performed using the modified capillary rheometer. Correlation between flow instability observed in flow visualization and pressure fluctuation was estimated. The alumina suspension showed various flow instabilities while forming no-flow region near the channel wall and significant fluctuation of flow boundaries. These flow instabilities exhibited time periodic behavior and could be divided into 3 types depending on time period. At the same time, the suspension exhibited large pressure fluctuation with various time periods which were found to be strongly correlated with those of flow instabilities.