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Analysis of electrokinetic response of solid-liquid mixture during expression operation (Article)

Iwata, M.^a ✉️, Shimoizu, K.^a, Sadai, H.^a, Iwasaki, T.^a, Nakamura, K.^b, Jami, M.S.^c 👤

^aDepartment of Chemical Engineering, Faculty of Engineering, Osaka Prefecture University, 1-1 Gakuen-cho, Naka-ku, Sakai-shi, Osaka, 599-8531, Japan

^bDivision of Materials Science and Chemical Engineering, Faculty of Engineering, Yokohama National University, 79-5 Tokiwadai, Hodogaya-ku, Yokohama, 240-8501, Japan

^cDepartment of Biotechnology Engineering, Faculty of Engineering, International Islamic University Malaysia, P.O. Box 10, Kuala Lumpur, 50728, Malaysia

Abstract

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In the expression process of slurry material using a filter-press of compression type, the process is divided into two periods: the filtration period and the consolidation period. Identification of the exact time of the culmination of filtration period is essential for operating the press effectively. This study focused on the electrokinetic phenomena during expression operation of zinc oxide slurry to obtain information on the status of the filter chamber. We have measured the time course of electrical potential difference (EPD) between both ends of expressed material during the expression process using a laboratory piston press. The absolute value of EPD increased with the progress of the filtration period, followed by the decrease during the consolidation period. It was observed that the time at which the absolute value of the EPD began to decline coincided with the time at which the filtration period ended. EPD reached the plateau value at the end of consolidation. In a consolidation of homogeneous semisolid material, the absolute value of EPD increased at the beginning of the operation, followed by the decline to the plateau value. We have extended the theoretical equation of streaming potential for a straight capillary to be applied to a tortuous flow path of the expressed material. The time course of EPD can be qualitatively explained by using the proposed equation for EPD and calculated liquid pressure distributions based on the conventional filtration and consolidation theories by considering the medium resistance. © 2020 Elsevier B.V.

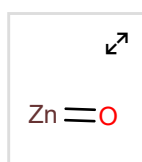
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