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## Constant pressure expression of power law non-Newtonian fluid / solid mixture (Article)

Iwata, M.<sup>a</sup> [✉](#), Shimo, T.<sup>a</sup>, Tanaka, T.<sup>a</sup>, Jami, M.S.<sup>b</sup> [👤](#)<sup>a</sup>Department of Chemical Engineering, Faculty of Engineering, Osaka Prefecture University, 1-1 Gakuen-cho, Naka-ku, Sakai-shi, Osaka 599-8531, Japan<sup>b</sup>Department of Biotechnology Engineering, Faculty of Engineering, International Islamic University Malaysia, P.O. Box 10, Kuala Lumpur, 50728, Malaysia

### Abstract

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Expression of non-Newtonian fluid / solid mixture is often encountered in the fields of polymer and food industries. However, a reliable method for the design of the expression process has not been established. In this study, we conducted expression experiments of power law non-Newtonian fluid / solid mixture under constant pressure condition. The basic consolidation equation was derived by combining the fundamental equation for power law non-Newtonian flow through the cake with the equation of continuity and solved numerically using the Runge–Kutta method. The progress of the expression is represented by an average consolidation ratio  $U_c$ . The agreement between calculated and experimental  $U_c$  was satisfactory when the creep deformation of the material was taken into consideration. It was also elucidated that the consolidation time required for attaining a certain degree of primary consolidation depends on the  $(N + 1)/N$ -th power of the total volume of the solid material  $\omega_0$ , where  $N$  is the flow behavior index of the squeezed liquid. On the other hand, the creep constants  $B$ , the ratio of creep deformation to the total deformation, and  $\eta$  a measure of the rate of creep deformation, both were found to be  $\omega_0$ -independent parameters, supporting the validity of the assumption made in the theoretical derivation. © 2018 Taiwan Institute of Chemical Engineers

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