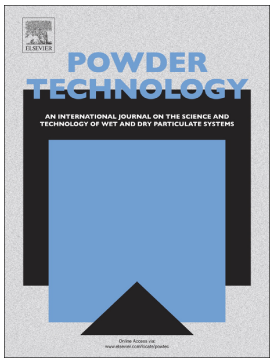

Effect of binder composition on rheological behavior of PMN-PZT ceramic feedstock

Jae Man Park, Jun Sae Han, Chang Woo Gal, Joo Won Oh, Kunal H. Kate, Sundar V. Atre, Youngmoo Kim, Seong Jin Park

PII: S0032-5910(18)30148-7
DOI: https://doi.org/10.1016/j.powtec.2018.02.027
Reference: PTEC 13203

To appear in: *Powder Technology*

Received date: 14 November 2017
Revised date: 23 January 2018
Accepted date: 10 February 2018

Please cite this article as: Jae Man Park, Jun Sae Han, Chang Woo Gal, Joo Won Oh, Kunal H. Kate, Sundar V. Atre, Youngmoo Kim, Seong Jin Park , Effect of binder composition on rheological behavior of PMN-PZT ceramic feedstock. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Ptec(2017), https://doi.org/10.1016/j.powtec.2018.02.027

Effect of binder composition on rheological behavior of PMN-PZT ceramic feedstock

Jae Man Park[1], Jun Sae Han[1], Chang Woo Gal[1], Joo Won Oh[1], Kunal H. Kate[2], Sundar V. Atre[2], Youngmoo Kim[3] and Seong Jin Park[1*]

[1]*Department of Mechanical Engineering, Pohang University of Science and Technology (POSTECH), 77 Cheongam-Ro, Nam-Gu, Pohang, Gyeongbuk, Republic of Korea, 37673*

[2]*University of Louisville, 2210, S Brook Street, Shumaker Research Building, 214, Louisville, KY, USA, 40208*

[3]*Agency for Defense Development, P.O. Box 35, Yuseong-gu, Daejeon, Republic of Korea, 34186*

*Corresponding Author: Prof. Seong Jin Park

Tel. No. : +82-54-279-2182

E-mail: sjpark87@postech.ac.kr

Abstract

An investigation of the effect of binder composition on rheological behavior of lead magnesium niobate–lead zirconate titanate (PMN-PZT) ceramic feedstock is presented in this paper. Rheological behavior is the key factor for manufacturing a micro-sized structure with high aspect-ratio. Each binder composition was categorized into three groups to analyze the effect based on the variation of ratio within filler (first), within backbone (second), and between filler and backbone (third). The critical solids loading for each feedstock was evaluated using a torque rheometer. To compare the net effect of binder composition, all the feedstocks were mixed with the solids loading of 45 vol.%. The effects of binder composition on rheology were analyzed using a capillary rheometer with different shear rates and temperatures. The main rheological parameters, such as viscosity, shear sensitivity, and temperature sensitivity, were closely related to the molecular weight difference in binder composition. First, the viscosity increased as the ratio of binders with higher molecular weight increased for each group. Second, the sensitivity of viscosity on shear rate was enhanced with the increase of polyethylene (PE) in the second and backbone in the third, respectively. Third, the sensitivity of viscosity on temperature was lowered as the amount of binders with higher molecular weight increased for each group. Based on the experimental results, the moldability index as a function of viscosity, shear sensitivity, and temperature sensitivity was calculated. The feedstock with the largest amount of filler showed the best rheological property for powder injection molding.