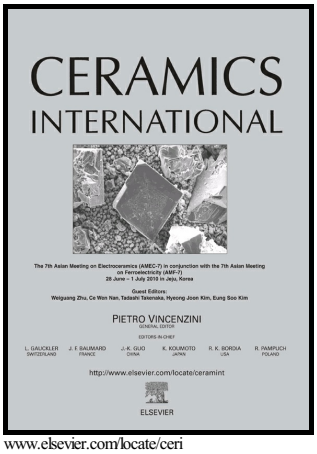

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PII: S0272-8842(16)31883-1
DOI: http://dx.doi.org/10.1016/j.ceramint.2016.10.115
Reference: CERI13994

To appear in: *Ceramics International*

Received date: 31 August 2016
Revised date: 18 October 2016
Accepted date: 18 October 2016

Cite this article as: Chenyang Zhang, Zhijie Zhang, Yue Tan and Mingfeng Zhong, The Effect of Citric Acid on the Kaolin Activation and Mullite Formation, *Ceramics International*, http://dx.doi.org/10.1016/j.ceramint.2016.10.115

The Effect of Citric Acid on the Kaolin Activation and Mullite Formation

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Abstract

The mullite phase in porcelain is important to the porcelain strength; however, its formation from clay minerals usually requires high temperature. Here we found that the activation of kaolin by citric acid would lower the formation temperature of mullite phase to 935.1°C, which is 67.5°C lower than that for the raw kaolin. Needle-like mullite crystal, a desired crystal shape in kaolin, could be observed in activated kaolin at 1050°C. The reduction of mullite formation temperature is due mainly to the surface change in kaolin. Upon citric acid activation, the pseudohexagonal platelets of kaolinite crystal are disintegrated to non-uniform flakes, and the specific surface area increases from 8.18 m^2/g to 31.21 m^2/g, both leading to improved activity of kaolin and increased sintering driving force. The results are of interest in producing high-strength porcelain at reduced sintering temperatures and consequent energy saving for sintering process.

Keywords: Kaolin; activation; citric acid; mullite; formation temperature

1. Introduction

During the porcelain firing of the triaxial mixtures of clay, feldspar, and quartz, the mullite formation is the most important factor on the mechanical properties of porcelain products [1].