Rababe Sani et al., J Mat. Sci. 2017, 5:6
DOI: 10.4172/2321-6212-C1-008

Sintering of ceramic materials using Refused Derived Fuel (RDF): A non-isothermal kinetic model

Rababe Sani, Doan Pham Minh, Thierry Cutard and Ange Nzihou
Universite de Toulouse, France

Number of studies has suggested the description of sintering steps during firing ceramic materials. However, these studies have shown considerable variations in the description of each step of sintering and still rare are those interested by ceramic materials produced from clay/additive mixtures. In this work, new ceramic materials have been developed using raw clay and additives matter such as Refused Derived Fuel (RDF). A multi-step kinetic model for the sintering of clay with and without RDF incorporation was developed. The sintering process of these ceramic materials was investigated by the non-isothermal Thermo Mechanical Analysis (TMA) under constant load (10 g) and oxidant atmosphere. The compacted samples were heated up to 1100 °C with Constant-Heating-Rate (CHR) of 2, 5 and 10 °C/min, respectively. The sintering mechanisms and kinetic parameters were determined for each step. As novelty, Fraser-Suzuki Deconvolution (FSD) and Kissinger-Akahira-Sunose (KAS) methods were used together to determine activation energy (Eα) for each pseudo-component during firing of clay and clay/RDF mixture, respectively. The kinetic function f(α) was determined by the master-plot method and eventually the pre-exponential factor (A). Sintering of clay material was described by two steps, whereas for the clay/RDF mixture, a new viscous phase related to the physicochemical transformation of RDF appeared. Thus, its sintering took place with three individual steps that developed in parallel. It was demonstrated that the last step of sintering related to the crystallization of spinel phase ($Si_3Al_4O_{12}$) was appropriately described by the Johnson-Mehl-Avrami (KJMA) equation. The ceramic material compositions and contribution of each step of sintering were discussed.

Biography

Rababe Sani is currently pursuing PhD from School of Albi Rapsodee Mines. She works on the physicochemical transformations of ceramic materials during firing process.

rababe.sani@mines-albi.fr

Notes: