

Formulation of clay refractory bricks: influence of the nature of chamotte and the alumina content in the clay

Moustapha Sawadogo

Université Joseph KI ZERBO, Ouagadougou, Burkina Faso;

sawtapha22@yahoo.fr

Refractory materials from kaolinitic clays and clay chamotte or quartz were studied to increase the refractoriness under load at temperature above 1300°C. Two different clays mined in Burkina Faso were used and chamotte grains were obtained by preliminary firing a local clay. Fired materials at 1350-1400°C present a typical granular composite microstructure where large grains of chamotte or quartz are embedded in the clay matrix phase. Under load at high temperature, the behavior of material is influenced by the nature of the clay matrix phase that progressively melt at high temperature, the type of chamotte or quartz grains, the grain sizes of different phases and the sequence of the thermal transformations during firing. Kinetics of creep under a constant load were characterized against temperature and time. It gives the typical temperatures at fixed creep strains, that's a well-recognized method for the refractoriness quantification. It's shown that the kinetic of creep change with the variation of viscosity with temperature of the melted clay matrix phase, that's related to both the chemical composition and the extend of the micro-composite nature of the heat transformed clays. Results also indicated that values of activation energy for creep are correlated to the refractoriness of materials.

- [1] Jacques Poirier : Les céramiques réfractaires de l'élaboration aux propriétés d'emploi. Verres Céramiques et Composites. Volume 1, **28-42**, (2011). <https://reue-vcc.univ-setif.dz>
- [2] Abba Mecif, Julien Soro, Abdelhamid Harabi, Jean Pierre Bonnet : Preparation of Mullite- and Zircon-Based Ceramics Using Kaolinite and Zirconium Oxide: A Sintering Study. *Journal of the American Ceramic Society* **93** (5), 1306-1312, 2010. <https://doi.org/10.1111/j.1551-2916.2009.03595.x>
- [3] Bahia Rabehi : Evaluation des propriétés réfractaires et cimentaires du kaolin de Djebel Debbagh. Thèse de l'université de M'Hamed Bougara-Boumerdes ; (2013). <http://dlibrary.univ-boumerdes.dz:8080/handle/123456789/1259>
- [4] Edwige Yeugo-Fogaing, Marc Huger, Thierry Chotard, Christian Gault : Caractérisation de l'endommagement d'origine thermique de réfractaires de type électrofondu par techniques acoustiques à haute température. *Matériaux* 2006, Dijon, France. 7 p. <https://hal.archives-ouvertes.fr/hal-00144564>
- [5] G. Aliprandi : Matériaux réfractaires et céramiques techniques. Editions Septima, Paris (1979).

Keywords: clay, chamotte, mullite, refractoriness