

Simulation of Microwave Heating of Mullite Rods

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Microwave processing has been studied as an alternate heating technique over conventional heating for industrial applications. Some advantages include quicker and more uniform heating. Also, microwave energy offers the advantage of localized heating and smaller-sized equipment. Many ceramics, however, are difficult to heat using microwave energy by reason of the strong temperature dependence of the dielectric loss. The ability of a ceramic to absorb microwave energy, a measure of its dielectric loss, increases with temperature which makes the material more susceptible to thermal runaway. The purpose of this research is to develop a model that accurately reproduces experimental data and can be used to explore new applicator designs for continuous processing of such ceramics. A two-dimensional numerical model, created for this purpose, assumes that the ceramic is a circular cylinder that moves either longitudinally through a microwave cavity of given dimensions. By adjusting the electromagnetic field so that the absorbed power matches the measured power, the model successfully imitates experimental results and avoids thermal runaway while achieving high temperatures.