Abstract

A novel way of regulating conditions in a thermoacoustic reactor is presented in this work. With this regulation we managed to control the temperature and the composition of flue gases (oxidative, reductive). The regulation was managed in such a way that it is suitable regardless of the reactor geometry, although this is a known issue for thermoacoustic systems. We have also used a mathematical model to help us scale up the reactor. The model is based on findings in the literature and is focused on the frequency and amplitude of pressure oscillations.

Various lithium insertion materials were synthesized in the thermoacoustic reactor, like lithium iron phosphate, lithium nickel cobalt manganese oxides and lithium rich oxides. With proper precursor composition these materials were synthesized on a nano scale. The influence of conditions in the thermoacoustic reactor on the material was also analyzed; the focus was on morphology, crystal phases and electrochemical properties. With this work we have shown the diversity of this synthesis method which is an advantage compared to other synthesis methods. A comparison of different precursor compositions and their influence on the quality of the material was conducted.

Keywords: thermoacoustic reactor, lithium insertion materials, lithium ion batteries, pulse combustor