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A systematic approach towards the synthesis of zeolites and geopolymers from South African coal fly ash on a large scale

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This paper discusses South African coal fly ash characteristics and the suitability of the ash for zeolites synthesis. The chemistry and physics involved in the synthesis and various methods that have been used to synthesize pure phase zeolitic compounds were discussed, drawing examples from published works of researchers from Europe, China, India and those in South Africa. An outline of necessary conditions to consider when considering the synthesis on a large scale is discussed especially with reference to some of the successes and contradictions that have been recorded in the literature. The view is to reveal the limitation(s) of some methods with respect to scale-up opportunity. The results of our recent study on sonochemical treatment of fly ash to achieve pure phase zeolite A was highlighted and it was concluded that although sonochemical techniques may appear to be a good candidate of choice, its scalability is currently not clear. Further results from previous work was used to argue for the exploitation of the hydrodynamic cavitation offered by jet loop reacting system with a view to achieve the objective of design of a scalable process for the synthesis of targeted zeolite.

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The use of educational software Modellus® to increase the education of mass and energy balance in the course of chemical engineering

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Neves et al. (2009) state that the teaching of chemistry due to a highly experimental context, presents abstract content difficult to understand and visualize, and has followed a traditional approach, sometimes described as mechanics, which, according to students, makes the class uninteresting and complex, especially in solving calculations involving mass and energy balances in the context of chemical engineering. From this perspective, the use of educational software has been a good addition to classes taught by teachers, as it stimulates different directions at the same time, as the context and questioning can encourage students to seek new knowledge. For this purpose, combustion of ethane was simulated using residual current combustion in a heater, in order to obtain water vapor using software Modellus. This software stands out for being governed by a simple mathematical model and teaching to be made, displaying graphs and numerical dynamic results accurately and also allow the creation of animations, making it extremely feasible to simulate the mass balance in ethane. The combustion calculating the composition of the output current as a function of such variables, as amount of alimantado ethane, excess air, percentage conversion and self reduction in the ratio CO/ CO_2. This stream is sent to a heater where its temperature is raised to a value T being defined in matemático model, thus enabling the realization of energy balance and thus the calculation of the amount of heat Q that should be supplied to the heater. Therefore, the modeling provides students a kind of laboratory in their classroom, an environment generated by the software, which displays in "real time" system behavior before each change, motivating students, promoting the expansion of capacity cognitive enhancing their theoretical knowledge, enabling the expansion of practical knowledge and the free interaction between students and their teachers.

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