The Design of a Main Column Block for Methanol Production with 400000 tons p.a. output

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The research is devoted to the design of a main column block for methanol production with 400000 tons p.a. output based on the following schemes: 1) a single-column scheme, 2) a two-column scheme, where the one column is under atmospheric pressure while the other is under the pressure of 3ATM, 3) a two-column scheme, where the one column is under the pressure of 5.8ATM, and the other is under atmospheric pressure, and 4) a three-column scheme, where the first column is a high pressure column, the second one is under the pressure of 5.8ATM, and the third column is under atmospheric pressure. Given schemes are examined in terms of capital costs and energy assessment with various types of nozzles to determine the optimal design of columns based on minimum costs.

Wet Chemical Synthesis of Nanoparticles

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The study is devoted to the development of wet-chemistry approaches for the synthesis of $LaPO_4$ nanoparticles and powders. $LaPO_4$ is a kind of high performance structural ceramic materials that can be used in harsh conditions due to a high melting point, low thermal conductivity, radiation damages resistance, magnetic and optical properties. Today wet-chemistry approaches refer to a group of methods of powder and material production using liquid phase at one of the process stages. The main differences between wet chemistry products and similar products of solid-phase synthesis are much smaller grains (crystallites) and, usually, lower temperature and shorter duration of phase formation. This work highlights the hydrothermal method and microwave and microreactor synthesis. The research investigates the morphology and phase composition changes of $LaPO_4$ by varying treatment time and the method of synthesis. The prospects of using synthesized nanoparticles for obtaining nanopowders or compact materials are largely determined by their morphological characteristics, chemical, phase and rheological properties.

Synthesis of Imidazoline Corrosion Inhibitors based on Diethylenetriamine

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1,2-disubstituted imidazolines are widely used as the basis for film-forming hydrocarbon-soluble corrosion inhibitors. High polarity and basicity and reduced surface activity favorably influence the anticorrosive properties of these inhibitors. They produced by amidation of tall oil fatty acids (TOFA) with diethylenetriamine and other amines through the formation of linear amides in industry. As a result, the reaction mixture consists of two types of imidazolines and their intermediates. However, quantitative analysis of this mixture is a difficult task due to the high boiling point of the reagents. Therefore, it was proposed to obtain model products based on the amidation of ethyl acetate with further preparation of calibration mixtures. Pure imidazoline-1 have been prepared and analyzed by gas chromatography, NNR spectroscopy and mass spectrometry by now. In my future work it is planned to obtain pure imidazoline-2, synthesize imidazolines based on TOFA and test the inhibitory ability of the resulting products.