DESCRIPTION FOR THE GENERAL PUBLIC

The work aims to determine the influence of process parameters on the precipitation process of molybdenum sulfide nanoparticles in jest reactors and devise a theoretical model describing the creation of such particles. Molybdenum sulfide is mostly used as a solid lubricant due to its layered structure of crystals and its application in conditions excluding the use of graphite lubricants. However, its potential applications are broad. In fuel and petrochemical industry, molybdenum sulfide is used as a catalyser. It is resilient to sulphur compounds that contaminate hydrocarbons. Due to its specific electromagnetic properties, it is considered as an alternative compound to silicon and graphene. Intensive research is being carried out on the use of molybdenum sulphide in the production of transistors. So far, molybdenite mineral obtained as a by-product in the extraction and treatment of copper has been the main source of MoS_2. It is directly reflected in the high price of molybdenum sulfide particles, which leads to their limited use, mostly in military space technologies. Therefore, new cheaper methods of obtaining MoS_2 particles are being examined. One of them is the so-called "wet" method, which uses water solutions of citric acid, ammonium heptamolybdate and ammonium sulphite.

This method is not described, especially there is no description of the kinetics of particle precipitation. Depending on the potential application, there is a need to produce particles with other desirable properties such as shape or size of crystals. A detailed description of the process, starting from the precipitation kinetics including nucleation and aggregation, through mixing, will bring tangible benefits, above all it will allow to determine the effect of process conditions on the MoS_2 precipitation, which in consequence will determine the type and work parameters of the chemical reactor type.

Nanoparticle production in a continuous mode through precipitation requires the use of a proper reactor. Impinging jets are frequently used in the industry since they allow for almost immediate jet mixing on a molecular level, which plays a crucial role in obtaining products of high quality. Reactor's geometry, frequently determined individually in each case, is crucial in selecting the proper jet reactor. To do that, computational fluid dynamics and advanced large eddy simulations are applied.

It was hypothesized that through relevant execution of the process of molybdenum disulfide particle creation in jet reactors, it will be possible to obtain particles of suitable properties in terms of their application. It will lower energetic costs of production, eliminate production stages (e.g. mixing) and by-products frequently harmful to the environment, as well as influence product price and availability in the future.