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# ROZPRAWA DOKTORSKA

Wybrane zagadnienia przenoszenia skali w krystalizatorach  
z wewnętrzną cyrkulacją zawiesiny  
Selected scale-up problems in the crystallizers with inner circulation  
of suspension

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## Summary

Scale-up in case of crystallization from solution is a very difficult issue. The influence on the final effect of this process have both kinetics and fluid dynamics. In this thesis the attempt was made to find the procedure combining laboratory results with industrial unit design. The parameter chosen as the best to present the changes in kinetics and hydraulics with increasing scale of apparatus was primary circulation time (PCT). The theoretical considerations showed that in commonly used methodology the kinetic requirements and hydrodynamic capabilities cannot be fulfilled at the same time. In order to do that the PCT should not change. The attempt to solve this problem was made using computational fluid dynamics by simulating a sequence of crystallizers varied by volume with preservation of geometrical similarity. Then the relaxation of full geometrical similarity was applied by change in width of the gap between draft tube and stirrer. The obtained results suggest that the full geometrical similarity should not be preserved while scale-up and the maximal linear scale-up coefficient should not be larger than 5. Moreover, in order to preserve the chosen parameter (PCT) the laboratory apparatus should be of the simplest construction with the worst hydraulic conditions, whereas the full-scale crystallizer should be of the optimized construction.

