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## **Dispersion of nanoparticles with optimal control theory based on destabilization**

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Nanoparticles are used extensively as materials for medicine and cosmetics and so on. Nanoparticles in solutions tend to flocculate. In a practical way, flocculated nanoparticles are not useful, because these can cause a loss of properties. Thus, to construct methods for dispersion of nano particles is important. Recently, more effective method is proposed in an experiment by using a back pressure valve [1]. Our goal is to make an theoretical explanation for the experiment. As the first step, in this poster, we make construct mathematical control theory based on unstablization of nano particles. From the view point of dynamical systems, the fact that nanoparticles tend to flocculate indicates that flocculated nanoparticles are more stable than dispersed ones. Thus, if flocculated state would become unstable by adding some control input, flocculated nanoparticles could disperse. Our control theory is constructed based on this idea.

[1] N. Manabe, S. Hanada, N. Aoki, Y. Futamura, K. Yamamoto and T. Adschiri, Journal of Chemical Engineering of Japan. **45**, 917 (2012).