Asymptotic stability of a catalyst particle - DTU Orbit (09/12/2018)

Asymptotic stability of a catalyst particle

The catalyst asymptotic stability problem is studied by means of several new methods that allow accurate solutions to be calculated where other methods have given qualitatively erroneous results. The underlying eigenvalue problem is considered in three limiting situations $Le = \infty$, 1 and 0. These are solved first to give expansion functions for the full eigenproblem at an arbitrary value of Le. A modified Galerkin method based on the two sets of eigenfunctions for the $Le = 1$ problem even in the lowest order approximation able to solve the full problem for all Le. Perturbation methods developed from the solutions at the limiting Le-values may if properly handled be extremely useful, e.g. for calculating the stability limit. Finally approximate values of the higher eigenvalues are found by simple formulas based on the steady state solution. Thus the whole eigenvalue spectrum can be studied in detail and certain properties of the spectrum that should appear also with other rate expressions are described.

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