Rare Earth Solvent Extraction Process Simulation and Design

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In this study, new algorithms are developed to simulate the solvent extraction process of which purpose is to separate desired rare earths from multi-components rare earth solution. PC88A and saponified PC88A are used as acidic organophosphrous solvents. Because the thermodynamic equilibrium equations for the rare earth solution have a huge number of variables, it is extremely hard to solve the nonlinear equations in a numerically stable manner due to the initial value problem and divergence problem of the equation solver. So, New model reduction method is developed to overcome the numerical problems by reducing the number of the equations. Next, a new thermodynamic equilibrium solver based on the model reduction method is developed, showing no numerical problems such as initial value problems and divergence problems. Finally, a process simulator for the solvent extraction process to purify the rare earth solution is developed, estimating successfully all concentrations of all stages without any problems. Also, the proposed method can estimates thermodynamic parameters from experiment data.