Data-driven modeling of ammonia based CO_2 capture process using recursive kernel PLS

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In recent years, aqueous ammonia has been received great attention as an effective absorbent in the post-combustion CO_2 capture technology due to its high absorption capacity and low energy requirements. Despite these advantages, in the engineering point of view, the relatively complex process dynamics involved in the chemical reactions of H_2O-CO_2-NH_3 mixture makes the assessment of current process condition very difficult during the operation and necessitates reliable analysis tool which can interpret the process behavior efficiently. Based on this consideration, a recursive kernel partial least squares (RKPLS) algorithm was newly proposed as an adaptive nonlinear multivariate statistical process control technique and applied to a pilot-scale plant for the monitoring and the prediction of overall process performance. The comparative studies were conducted by considering various kinds of statistical models and the results indicated that the RKPLS was superior to others in that it can efficiently take into account for the nonlinear and the time-varying characteristics of the given process.