

## **An Application of SVD and Wavelet Transform to the Advanced NMR Signal Process**

**Daesung Kim and Hoshik Won**

*Department of Chemistry, Hanyang University*

In recent, some interesting new techniques for the signal processing have been developed to improve a S/N ratio and to suppress unwanted large signal like a water peak in the poor NMR spectrum. The importance of signal enhancement lead us to develop methods of noise reduction and large peak suppression by Singular value decomposition (SVD), discrete wavelet transform(DWT) and continuous wavelet transform(CWT).

SVD has been used during past few decades in the advanced NMR data processing and in many applicable areas. A new modified SVD, piecewise polynomial truncated SVD (PPTSVD) was developed for the large solvent peak suppression and noise elimination in NMR signal processing. PPTSVD consists of two algorithms of truncated SVD (TSVD) and L1 problems. In TSVD, some unwanted large solvent peaks and noises are suppressed with a certain soft threshold value while signal and noise in raw data are resolved and eliminated out in L1 problem routine. The advantage of the current PPTSVD method compared to many SVD methods is to give the better S/N ratio in spectrum, and less time consuming job that can be applicable to multidimensional NMR data processing.

Wavelet transforms were also introduced as a new tool to distinguish real peaks from the noise contaminated NMR data. New algorithms of two wavelet transforms including Daubechies wavelet transform as a discrete and orthogonal wavelet transform (DWT) and Morlet wavelet transform as a continuous and nonorthogonal wavelet transform(CWT) were developed for noise elimination. DWT and CWT method were successfully applied to the noise reduction in spectrum. The inevitable distortion of NMR spectral baseline and the imperfection in noise elimination were observed in DWT method while CWT method gives a better baseline shape and a well noise suppressed spectrum.