

Separation of two dimensional diffusion and relaxation time distributions from oil/fat and moisture in food

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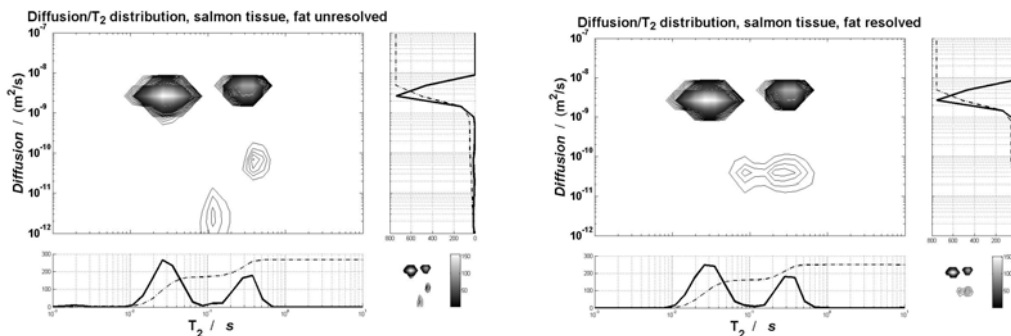
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In combined relaxation time measurements and diffusion measurements on heterogeneous systems using low field NMR equipment, the result of the data analysis may be of a non unique character, and the output may be significantly dependent on the tool used for analysis. For example when applying a two dimensional inverse Laplace (2D-ILT) routine, the number of components resolved is dependent on the degree of smoothing, of the noise or on relaxation time or diffusion coefficient intervals used as input to the routine. However, using the significant difference in molecular mobility of oil and moisture, it is possible to resolve the contribution prior to any data analysis [1]. Then the oil and moisture signal can be analysed separately, and results in stable solutions insensitive to changes in smoothing or intervals used in the analysis. Figure 1 shows the results of applying 2D-ILT on a data set arising from a salmon tissue sample containing small amounts of oil, where oil and moisture signals are unresolved (left) and resolved (right) prior to 2D-ILT analysis.

Figure 1: The result of 2D-ILT of salmon tissue sample



Without separation of fat and moisture prior to 2 D-ILT analysis, the fat component does not result in a stable solution and its diffusion coefficient varies almost two orders of magnitude. With separation of fat and moisture prior to 2D-ILT analysis, the fat component also yields a stable solution and a diffusion coefficient of $2.5 \cdot 10^{-11} \text{ m}^2/\text{s}$ (at 40°C).

References:

[1]: Sørland et.al: Applied Magnetic Resonance, **26**, 417 (2004)