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Heats of Dissolution of Fatty Acids-Nicotinamide Equimolar Complexes in Ethanol*

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The heats of dissolution (ΔH_d) of fatty acids (FA)-nicotinamide (NAA) complexes, $(FA)_6(NAA)_6$, were measured at 310.15 K in ethanol using a calorimetric technique, where the FA were tetradecanoic acid (C14), pentadecanoic acid (C15), hexadecanoic acid (C16), heptadecanoic acid (C17) and octadecanoic acid (C18). The values of ΔH_d were 527.9 574.6 592.7 640.1 and 656.6 kJ mol^{-1} for $(C14)_6(NAA)_6$, $(C15)_6(NAA)_6$, $(C16)_6(NAA)_6$, $(C17)_6(NAA)_6$ and $(C18)_6(NAA)_6$, respectively. The values of ΔH_d of $(FA)_6(NAA)_6$ increased by increasing the carbon numbers (n) of the constituent FA. However, the plots of ΔH_d of $(FA)_6(NAA)_6$ against n showed a zig-zag pattern with an upward convex at an odd-numbered position. This is the same tendency as observed for FA-thiamine disulfide (TDS) complexes, $(FA)_6(TDS)$.

The differences between ΔH_d of $(FA)_6(NAA)_6$ and ΔH_d of (6FA +6NAA) were 30 − 48 kJ mol^{-1} for even-numbered FA and 45 − 53 kJ mol^{-1} for odd-numbered FA, indicating a stronger binding force for $(FA)_6(NAA)_6$ formed with odd-numbered FA than that formed with even-numbered FA. Furthermore, the estimated values of the binding force between FA and NAA are very small, leading to a conclusion that $(FA)_6(NAA)_6$ is an inclusion compound or a clathrate formed by van der Waals forces and hydrophobic interactions between FA and NAA.

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