Confirmation of the Existence of Modulation Wave Motion in Incommensurate Rb$_2$ZnCl$_4$ by Hahn Echo and 2D NMR

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$^{87}$Rb Hahn echo nuclear magnetic resonance (NMR) and $^{35}$Cl Hahn echo nuclear quadrupole resonance (NQR) measurements were performed at 293 - 302 K in the incommensurate (I) phase of Rb$_2$ZnCl$_4$. The existence of a Hahn echo decay that is shorter than the true $T_2$ and one that has an exponential dependence on the cube of the echo time indicates the presence of slow motions. The diffusion coefficient $D$ can be obtained from the rate of decay of the Hahn echo. Similar values for $D$ were obtained from the two different measurements, indicating that both the Rb and the Cl atoms are experiencing the same motional mechanism. This mechanism must be due to simultaneous motions of each and can not be due to individual motions of only one type of atom. Further confirmation of the presence of modulation wave motion was obtained from$^{87}$Rb two-dimensional (2D) exchange-difference NMR measurements.

Key words: Incommensurate; Modulation Wave; Hahn Echo; 2D Exchange NMR.