Topological Structure of Phase Vortex in Resonating Valence Bond Superconductivity

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Abstract: In this paper, based on the Schrödinger equation and the Ψ-mapping theory, the accurate expression for the gradient of resonating valence bond superconducting phase Θ^s is found. The expression of $\nabla\Theta^s$ is just the velocity flow V without considering the coefficient. The curl of $\nabla\Theta^s$ is where the vortex lies, and has important relation to $\delta^2(\Psi)$ and an important relation to the zero points of resonating valence bond superconducting order parameter Ψ. The topological structure of the vortex is characterized by the Ψ-mapping topological numbers Hopf-index and Brouwer degrees. The Ginzberg-Landau equation in resonating valence bond state also is discussed in this theory. The magnetic property is discussed also.

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