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Interplay of Magnetism and Superconductivity in $CeCu_2Si_2$ and RNi_2B_2C Probed by Neutron Scattering MICHAEL LOEWENHAUPT, TU Dresden, OLIVER STOCKERT, MPI-CPfS, ANDREAS KREYSSIG, TU Dresden — We will discuss results of neutron scattering experiments performed on two systems that were investigated in close collaboration with other groups: the heavy fermion superconductor $CeCu_2Si_2$ and the borocarbides RNi_2B_2C (with R = rare earth). In both systems SC and magnetic ordering is observed. Due to minor changes in stoichiometry single crystals of A-, A/S and S-type $CeCu_2Si_2$ can be grown that show only long range magnetic order (LRO), both SC and LRO, and only SC. However, LRO is suppressed as soon as SC sets in (phase separation in A/S-type crystals). In S-type crystals only short range correlations are observed that develop an energy gap in the magnetic excitation spectrum below T_C . In the borocarbides both LRO and SC coexist (e.g. for $HoNi_2B_2C$: $T_C = 8$ K and $T_N = 6$ K). However, there is no change in the diffuse neutron scattering (being a signature of the susceptibility of the conduction electrons) for temperatures above and below T_C (but still aboveT_N). The origin of SC in the borocarbides is manifested in a strong phonon softening intimately connected with the development of the SC gap. Conclusion: Magnetism and superconductivity in $CeCu_2Si_2$ is (phase) separated in real space while in the borocarbides both phenomena may be understood as being decoupled in momentum space.

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