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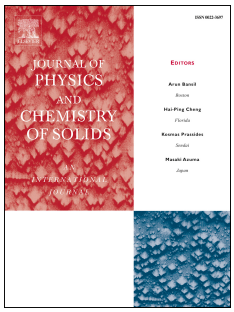

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Magnetic structures of rare earth intermetallic compounds $RCuAs_2$ (R = Pr, Nd, Tb, Dy, Ho, and Yb)

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Abstract

Neutron scattering studies have been carried out on polycrystalline samples of a series of rare earth intermetallic compounds $RCuAs_2$ (R = Pr, Nd, Dy, Tb, Ho and Yb) as a function of temperature to determine the magnetic structures and the order parameters. These compounds crystallize in the $ZrCuSi_2$ type structure, which is similar to that of the RFeAsO (space group *P*4/*nmm*) class of iron-based superconductors. $PrCuAs_2$ develops commensurate magnetic order with $\boldsymbol{K}$ = (0, 0, 0.5) below T_N = 6.4(2) K, with the ordered moments pointing along the ***c***-axis. The irreducible representation analysis shows either a Γ^1_2 or Γ^1_3 representation. $NdCuAs_2$ and $DyCuAs_2$ order below T_N = 3.54(5) K and T_N = 10.1(2) K, respectively, with the same ordering wave vector but the moments lying in the ***a-b*** plane (with a Γ^2_9 or Γ^2_{10} representation). $TbCuAs_2$ and $HoCuAs_2$ exhibit incommensurate magnetic structures below T_N = 9.44(7) and 4.41(2) K, respectively. For $TbCuAs_2$, two separate magnetic ordering wave vectors are established as $\boldsymbol{K}_{1(Tb)}$ = (0.240,0.155,0.48) and $\boldsymbol{K}_{2(Tb)}$ = (0.205, 0.115, 0.28), whereas $HoCuAs_2$ forms a single $\boldsymbol{K}_{(Ho)}$ = (0.121, 0.041, 0.376) magnetic structure with 3rd order harmonic magnetic peaks. $YbCuAs_2$ does not exhibit any magnetic Bragg peaks at 1.5 K, while susceptibility measurements indicate an antiferromagnetic-like transition at 4 K, suggesting that either the ordering is not long range in nature or the ordered moment is below the sensitivity limit of ≈ 0.2 μ_B.

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