Structure and magnetic properties of Eu- and Nd-doped flux-grown icosahedral Al-Cu-Fe quasicrystals

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Streszczenie

We explore the possibility of modification of the magnetic properties of flux-grown icosahedral Al-Cu-Fe quasicrystals by individual and combined doping with Nd and Eu. Different dopants alter the Cu/Fe ratio of the icosahedral phase. In all three cases, the electron density is concentrated in even- and odd-parity vertices and even-parity body center of the hypercubic unit cell, which is consistent with the F-type icosahedral lattice of similar systems. Nd-doping is correlated with higher occupancy, probably with denser Cu or Fe atoms, of the even-parity body center of the six-dimensional unit cell. Doping with one lanthanide produces a semihard magnet, while the sample doped with both Nd and Eu shows soft magnetic properties. The highest observed remanence and saturation magnetization were achieved via Eu doping; Nd+Eu yields half that value, and Nd only is even lower. Negative Curie-Weiss temperatures indicate strong antiferromagnetic long-range ordering with effective magnetic moments much smaller than expected for the Fe content. Comparison of the effective anisotropy energy distribution versus angle and magnetic field revealed the easy magnetization direction along preferred high-symmetry axes. The appearance of both 3

Słowa kluczowe

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