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Evidence of Chemical Phase Separation in $\mathbf{K_{0.65}Fe_{1.74}Se_2}$[1] SVEN LANDSGESELL, DANIEL ABOU-RAS, Helmholtz-Zentrum Berlin, THOMAS WOLF, Karlsruher Institut für Technologie, KAREL PROKES, Helmholtz-Zentrum Berlin — $K_xFe_{2-y}Se_2$ has been widely investigated and many samples show a co–existence of superconductivity and antiferromagnetic properties. Recently the it was shown that this system shows a clear phase separation, however the nature of the two phases remained unclear. In the present work we report on a chemical phase separation in crystalline superconducting $K_{0.65}Fe_{1.74}Se_2$, investigated by means of magnetization experiments, scanning electron microscopy, electron backscatter diffraction, and energy–dispersive X–ray spectrometry. It is shown that the crystal consists of platelets oriented in <100> with an approximated volume fraction of about 30% in the surrounding <001> oriented matrix. The platelets (the matrix) are depleted in K (Fe) and enriched in Fe (K). Chemical phase separation is demonstrated by a stable, antiferromagnetic $K_{0.8}Fe_{1.6}Se_2$ matrix, and $K_xFe_ySe_2$ platelets inducing superconductivity. This time driven chemical spinoidal phase separation may therefore be responsible for several alternative properties measured in $K_xFe_{2-y}Se_2$ samples as superconductivity and antiferromagnetism.

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