Spin-fluctuation induced non-Fermi-liquid behaviour with suppressed superconductivity in LiFe\(_{1-x}\)Co\(_x\)As

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We study a series of LiFe\(_{1-x}\)Co\(_x\)As compounds with different Co concentrations by transport, optical spectroscopy, angle-resolved photoemission spectroscopy, and nuclear magnetic resonance. We observe a Fermi-liquid to non-Fermi-liquid to Fermi-liquid (FL-NFL-FL) crossover alongside a monotonic suppression of the superconductivity with increasing Co content. In parallel to the FL-NFL-FL crossover, we find that both the low-energy spin fluctuations and Fermi surface nesting are enhanced and then diminished, strongly suggesting that the NFL behaviour in LiFe\(_{1-x}\)Co\(_x\)As is induced by low-energy spin fluctuations that are very likely tuned by Fermi surface nesting. Our study reveals a unique phase diagram of LiFe\(_{1-x}\)Co\(_x\)As where the region of NFL is moved to the boundary of the superconducting phase, implying that they are probably governed by different mechanisms.

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