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Influence of spin-orbit coupling on the metamagnetic transition in $Sr_3Ru_2O_7$ MARK FISCHER, MANFRED SIGRIST, Institute for Theoretical Physics, ETH Zurich, Switzerland — Clean single crystals of $Sr_3Ru_2O_7$ undergo a metamagnetic transition at low temperatures. This transition shows a strong anisotropy in the applied field direction with a critical field H_c ranging from 5.1T for the case of $H \perp c$ to almost 8T for $H \parallel c$. In addition, studies on ultra-pure samples revealed a bifurcation of the metamagnetic line for fields in c-direction and it is argued that a nematic phase emerges between the magnetization jumps. The aim of this study is to explain the field anisotropy of these phenomena. Based on a microscopic tight-binding model, we introduce the metamagnetic transition by means of a van Hove singularity scenario. We show that the rotation of the O-octahedra around the c-axis expected for this material introduces a staggered Rashba-like spin-orbit coupling within the planes and naturally leads to an anisotropy of the magnetic response. We describe the low-temperature phase as a nematic state favored by forward scattering processes. The spin-orbit coupling shows an influence on both, the critical field H_c and the occurence of the nematic phase.

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