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Towards magnetic trapping and evaporative cooling of atoms with non-zero orbital angular momentum: suppression of electronic interaction anisotropy in transition metal atoms ROMAN KREMS, CUA and ITAMP, Harvard-Smithsonian CfA, ALEXANDER DALGARNO, ITAMP and CUA, Harvard-Smithsonian CfA — Angular momentum transfer is expected to occur rapidly in collisions of atoms in states with non-zero angular momenta due to the large anisotropy of atom - atom electronic interactions. We show that despite the presence of internal angular momenta, transition metal atoms Sc (D-state atom) and Ti (F-state atom) interact in collisions with helium effectively as spherical atoms. The electronic interaction anisotropy of the transition metal atoms with He is dramatically suppressed due to the presence of the outer shell spherically symmetric s-state electrons. As a result, the angular momentum transfer is slow. Thus magnetic trapping and sympathetic cooling of transition metal atoms by collisions with S- state alkali metal atoms should be readily achievable. Our results open up new avenues of research in the ultracold regime with a broad class of complex transition metal atoms.

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