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Half-filled shell atoms as intense sources of spin-polarized photoelectrons[1] VALERIY DOLMATOV, University of North Alabama, Florence, AL, STEVEN MANSON, Georgia State University, Atlanta, GA — Intense beams of spin-polarized electrons are much needed because they are used in unique fundamental experimental studies in the area of photon-atom, electron-atom, and electron-molecular collisions. In the present paper, we predict a spin-polarized beam of photoelectrons of significant intensity results from photoionization of a closed ns^2-subshell of a spin-aligned atom having a multielectron half-filled subshell in its ground state. The polarization results from the specific properties of a half-filled shell atom due to the unbalanced exchange interaction between spin-up and spin-down electrons in the atom, both at the independent-particle and multielectron correlation levels. This mechanism causing the preferable spin orientation of outgoing photoelectrons (a) differs from the commonly known mechanisms yielding spin-polarized photoelectrons from atoms, (b) has advantages over the latter since, in the present case, it exhibits much larger intensity, and (c) the degree of spin-polarization depends neither on polarization of the incoming radiation nor on the angular distribution of emitted photoelectrons. Calculated results for the photoionization of the valence $4s^2$ subshell of a spin-oriented Mn($4s^2\ ^6S$) atom are presented.

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