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Ultracold interactions and collisions in quantum mixtures of highly magnetic atoms and alkali-metal atoms KLAUDIA ZAREMBA-KOPCZYK, Faculty of Physics, University of Warsaw, Poland, PIOTR ZUCHOWSKI, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University in Torun, Poland, MICHAL TOMZA, Faculty of Physics, University of Warsaw, Poland — We study ultracold interactions and collisions in quantum mixtures of highly magnetic S-state atoms, Cr ($^7S_3$) and Eu ($^8S_{7/2}$), and alkali-metal atoms. We investigate magnetically tunable Feshbach resonances between ultracold europium atoms and between europium and alkali-metal atoms using multichannel quantum scattering calculations [1]. The calculations are carried out for representative systems of ^{153}Eu+^{7}Li and ^{153}Eu+^{87}Rb, as well as for homonuclear ^{153}Eu+^{153}Eu and heteronuclear ^{153}Eu+^{151}Eu systems. We analyze the prospects for the control of scattering properties and magnetoassociation into ultracold polar and paramagnetic molecules. We show that favorable resonances can be expected at experimentally feasible magnetic-field strengths below 1000 G for all investigated atomic combinations. For the mixtures of chromium with alkali-metal atoms, we consider a prototype system of ^{53}Cr+^{6}Li. We calculate the potential energy curves for the CrLi molecule both in ground and excited states, investigate magnetic Feshbach resonances, prospects for photoassociation and application of CrLi molecules to precision measurements.

K. Zaremba-Kopczyk, P. S. Żuchowski, M. Tomza, Phys. Rev. A 98, 032704 (2018).

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