Prospects for efficient sympathetic cooling of OH radicals by ultracold Sr atoms\textsuperscript{1} MING LI, ALEXANDER PETROV, JACEK KLOS, SVETLANA KOTOCHIGOVA, Temple University — There is great interest in direct cooling of molecules down to $\mu$K temperatures. One candidate molecule is the hydroxyl (OH) radical, which can not be laser cooled but is of interest to chemistry. A recent experiment \cite{1} has succeeded to translationally cool OH to 5 mK via evaporative cooling. Sympathetic cooling of molecules in collisions with laser-cooled atoms can assist further cooling down to $\mu$K. Here, we theoretically explore the translational cooling of OH in collisions with Sr. First, we computed the multi-dimensional potential surfaces of SrOH. Second, for coupled-channels calculations we add spin-orbit, Omega doubling, Coriolis, and hyperfine interactions to describe OH. We also include non-adiabatic couplings between the potential energy surfaces, which have conical intersections (CIs) in collinear geometries. Finally, we computed the ratio between the rate of elastic or momentum-changing collisions and the rate for inelastic or energy releasing collisions at various entrance channels and collision energies. The role of the CIs is also investigated. \cite{1} B. K. Stuhl, M. T. Hummon, M. Yeo, G. Quéméner, J. L. Bohn, and J. Ye, Nature, 492, 396 (2012).

\textsuperscript{1}We acknowledge support from ARO Grant No. W911NF-17-1-0563, AFOSR Grant No. FA9550-14-1-0321, and NSF Grant No. PHY-1619788.