Spin-valley dynamics of interlayer excitons in heterobilayers $Mo_xW_{1-x}Se_2/WSe_2$

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We study spin-valley relaxation dynamics in two-dimensional $Mo_xW_{1-x}Se_2/WSe_2$ heterobilayers with different relative Mo/W concentration x in the monolayer alloy. Three types of heterobilayers with $x = 1.00$, 0.50, 0.33 are studied in time-resolved Kerr rotation experiments for different wavelengths and temperatures. The spin-valley relaxation times are found to decrease from ~ 10 nanoseconds for $x = 1.00$ to ~ 50 picoseconds for $x = 0.33$. The observed relaxation times are limited by the recombination of indirect excitons formed in the heterobilayers. Our results demonstrate that spin-valley relaxation in alloy-based van der Waals heterostructures can be controlled via their chemical composition.

Keywords: TMDC, heterobilayers, interlayer excitons, spin-valley relaxation.

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