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Spin-valley coupling in atomically thin tungsten dichalcogenides[1]

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The monolayers of group VI transition metal dichalcogenides feature a valence band spin splitting with opposite sign in the two valleys located at corners of 1st Brillouin zone. This spin-valley coupling, particularly pronounced in tungsten dichalcogenides, can benefit potential spintronics and valleytronics with the important consequences of spin-valley interplay and the suppression of spin and valley relaxations. In this talk we discuss the optical studies of WS2 monolayers and multilayers. The PL spectra and first-principle calculations consistently reveal a spin-valley coupling of 0.4 eV which suppresses interlayer hopping and manifests as a thickness independent splitting pattern at valence band edge near K valleys. This giant spin-valley coupling, together with the valley dependent physical properties, may lead to rich possibilities for manipulating spin and valley degrees of freedom in these atomically thin 2D materials.

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