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Spin-polarized electron sources for future linear colliders

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Spin-polarized electron photoelectron sources are a critical component of multiple future collider designs. The present state-of-the-art polarized electron photocathode material, negative electron affinity gallium arsenide, has remarkable performance: it possesses high quantum efficiency and can emit beams with a spin polarization exceeding 90% under the right conditions. However, its extreme vacuum sensitivity limits its application to guns with extreme high vacuum quality; this has the effect of constraining the peak source brightness. This vacuum sensitivity also limits the average current of the source. Both of these factors can constrain collider luminosity. In this presentation, I will describe alternatives to GaAs photocathodes such as GaN and alkali antimonide photocathodes, which have been demonstrated to emit spin-polarized electrons and have been shown to be much more robust to vacuum poisoning and high average current delivery. After describing these materials, I will discuss the prospects and potential performance of their use in high-field RF electron sources with high peak brightness.

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