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How thin film properties are defined by the arriving species on the substrate ?Diederik Depla¹, Stijn Mahieu¹¹Department of Solid State Sciences, Gent, Belgium

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Taking TiN as an example, the paper discusses the intimate relationship between the thin film properties and the particle fluxes towards the substrate. The total energy flux towards the substrate is defined by several processes. These will be discussed in detail, and the total energy flux will be related to the resulting crystallographic orientation and the microstructure of the thin TiN film. However can we understand all properties from this relationship? To use TiN thin films as back reflector in solar cells, a high optical reflection is needed which depends strongly on the density of the TiN thin films. But there seems no significant relationship between the energy flux and the density. Further investigation showed the importance of the momentum flux. The total momentum flux was characterized with a home-built monitor, while the partial momentum flux due to sputtered and backscattered particles was simulated with the Monte Carlo code SIMTRA. A clear relationship with the momentum flux of the sputtered and backscattered particles per deposited Ti particle and the density and optical reflection was found. In this way this study helps us to answer the title question.

Keywordsmagnetron sputtering
thin film growth