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Surface Segregation of W doped in ZnO thin films TAKU SUZUKI, YUTAKA ADACHI, NORIKO SAITO, MINAKO HASHIGUCHI, ISAO SAKAGUCHI, NAOKI OHASHI, SHUNICHI HISHITA, National Institute for Materials Science — We observed surface segregation of W (0.05-4 mol%) doped in ZnO films by the annealing above 900 K. The segregation coefficient was related with the crystal quality of the film, where slower segregation occurred with the better crystalline film. From the structure analysis using low-energy He^+ ion scattering spectroscopy, we found that W occupies the substitutional site of Zn at the outermost surface of O-face ZnO($000\bar{1}$) as a consequence of the segregation. On the other hand, we observed no sign indicating the occupation of W at a certain site in the ZnO lattice at the subsurface. Ultraviolet photoelectron spectroscopy (He I) on the ZnO surface segregated with W indicates that W is in the valence state of +6, and thus, the segregation of the W atom is most likely accompanied with two Zn vacancies. The ion beam mixing followed by the annealing of ZnO surface deposited with W provided the similar surface electronic structure to that of ZnO segregated with W.

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