

## Highly uniform InAs self-assembled quantum dots grown by metalorganic chemical vapor deposition with periodic AsH<sub>3</sub> interruption (PAI)

김정섭<sup>1</sup>, 양창재<sup>1</sup>, 신건욱<sup>1</sup>, 이영수<sup>2</sup>, 윤의준<sup>1</sup>

<sup>1</sup>서울대학교 재료공학부, <sup>2</sup>육군사관학교 물리학부

In present work, we grew InAs QDs by MOCVD with a new growth technique, namely periodic AsH<sub>3</sub> interruption (PAI) method, in order to suppress the formation of relaxed large islands. In contrast to the conventional method of QD growth, the supply of AsH<sub>3</sub> source was periodically interrupted while trimethylindium was introduced into the reactor continuously. By this method, the growth surface could be modulated from As-stabilized surface to In-stabilized one, resulting in the uniform strain distribution and the increase in In adatom migration length. Therefore, the homogeneous nucleation and uniform QD growth could be promoted in addition to reducing the amount of excess As known to cause dot coalescence. In order to demonstrate these effects, we varied the AsH<sub>3</sub> interruption time at fixed total amount of source supply. With long interruption times, large islands were formed. This phenomenon was also occurred with short interruption times, because sufficient times were not provided to modulate the surface condition. On the other hand, the formation of large islands was suppressed completely with the intermediate interruption time (~4 s). As a result, the PL peak intensity was significantly enhanced in comparison to the conventional QD growth method. In addition, we controlled the composition and thickness of InGaAs well layers in order to tune the emission wavelength. The redshift of the emission wavelength above 1.38  $\mu\text{m}$  was successfully achieved without broadening in linewidth.