nanolasers with MQW gain media, the authors agree that much more work should be done to conclude if it is possible or not to have a room temperature electrically pumped metallo-dielectric semiconductor nanolaser resonators with MQW gain media, but by now the evidences shown MQW are not the best suitable material to reach this objective.

In the case of bulk structure, we have shown the fundamental mode reaches the threshold condition long before the competition for carriers with the second mode starts. The cost of using a bulk gain media to avoid the second order mode is a higher threshold current in comparison with the MQW device. This threshold current can be reduced if the bulk ternary alloy is substituted by a bulk quaternary alloy whose available material gain is within the optimized threshold gain for a specific cavity.

These results show that while quantum well structures allow large semiconductor lasers to have very low threshold current, they can inhibit lasing action in high gain demanding nanolasers due to a competition between wells and the barriers for injected carriers. Although the optical gain for bulk material is smaller and the transparency carrier density is larger than for MQW structures, the high threshold gain and the barrier pumping problem makes bulk gain media more suitable for obtaining room temperature electrically pumped metallo-dielectric semiconductor nanolaser resonators.

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