**Topological Stability of Two-Dimensional Penta-Structures: a case of PdSe2**

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Here, we report a new approach to analize stability and apply them to several recently proposed penta-structures including experimentally observed penta-PdSe2 monolayer. Despite the fact that various 2D penta- structures have been predicted before, PdSe2 is the only one observed experimentally. It is found that stabilization of 2D PdSe2 is resulted from lowering of the symmetry during bulk-monolayer transition and structural-induced force compensation. The absence of internal flexural stresses in the single layer PdSe2 is validated by finite cluster approach as well as calculations of different diameter and chirality nanotubes. Electronic properties of (n,0) nanotubes reveal the direct dependence of indirect bandgap width on dimeter of the nanotube while (n,n) tubes with a diameter of (12,12) and higher possess transition to the direct band semiconductor that can be suitable for optoelectronic applications. Applying the same metods to other recently-proposed penta-structures, large instability was found in penta-graphene, penta-SiC2, penta-AlN2, penta-B2C, penta-CN2, petna-SnS2 and so on, that demonstrate the power of these methods.