**Highlights**

* Nanorange particles and grains of ZnO pellet was successfully achieved using “hybrid vibrational annealing and dry-quenching setup”, which is a simple and low-cost instrument designed indigenously, where mechanical vibrational energy was applied both during annealing as well as dry-quenching.
* For a comparative study, two types of samples i.e., ZnO annealed with and without vibration(ZWOV and ZWV) were synthesized using this set-up.
* XRD and TEM analysis was confirmed our desired results, where average particle size was reduced to be around from 36nm to 25nm. ZWV samples were found to have larger optical bandgap (~3.36eV) as compared to ZWOV sample.