INTRODUCTION:

- TMDs: Materials of the form MX₂ where M is a transition metal and X is any chalcogen
- Layered structure with each layer consisting of 3 atoms (metal atom sandwiched in between two chalcogen atoms)
- Tunable band gap that can undergo a transition from indirect bandgap in bulk materials to direct bandgap in monolayer sheet
- Structural polytypes: 2H, 1T and 3R

EXPERIMENTAL SECTION:

- Sample prepared by Liquid Phase exfoliation of bulk MoS₂ powder
- Initial concentration: 1mg/ml of bulk MoS₂ powder in a mixture of 2, propanol and Distilled water in 2:3 volume ratio
- Microwave (MW) treatment of MoS₂ dispersion for 10 minutes and 30 minutes.

RESULTS AND DISCUSSION:

- Figure 1. TEM micrographs of the MW treated sample. (a) Shows the flakes present in the sample which rolls and curls as shown in (b) and forms the rod/tube like nanostructures
- Figure 2. Consecutive TEM images before and after electron beam interaction (10 min MW irradiated sample)
- Figure 3. TEM images of 30 min MW treated sample after electron beam interaction. The sample shows the presence of a mixed phase (2H and 1T) with extreme electron beam stability
- Figure 4. Raman spectra of (a) 10 minute and (b) 30 minute MW treated samples respectively
- Figure 5. UV-Vis Absorption spectra of (a) 10 minute and (b) 30 minute MW treated samples respectively

CONCLUSIONS:

- Reasons for structural damage: (i) Radiolysis, (ii) Knock-on, (iii) Heating
- The structural transformation is aided by the microwave energy.
- Compared to 10 min MW (2H phase MoS₂) treated sample is found to be extremely vulnerable to electron beam while the 30 min MW treated sample (mixed phase of 1T and 2H MoS₂) is found to be stable towards electron beam (200-300 keV).

REFERENCES: