What do each of these have in common?
Synthesis of Precursors for Solar Cells

- Initial solar cells were made by using semiconductors with a transparent layer of gold (very inefficient)
- Later silicon was used but cell efficiencies was only about 6%.
  - Cell efficiency was increased by doping the silicon to form p–n junctions
  - This method takes lots of time and equipment
  - High temperature synthesis
- Dye sensitized solar cells increase cell efficiency to ~11%
  - This method offers the alternative of a low temperature synthesis
    - Chemical vapor deposition
    - Sol gel synthesis
Combining iron and phosphorus in stoichiometric amounts and heating to high temperatures > 1100°C

Problem
- results in a variety of phases difficult to separate
- No thin films or nanostructures possible

Used to produce high purity thin films

Advantages
- Results in one phase
- Can produce nanostructures
- Low temperature synthesis
- Used to make synthetic diamonds

Solid State

Chemical vapor deposition
Two quartz slides are cleaned and pasted onto a steel boat using silver paste. The boat is heated from ~135-140°C for 1.5 - 2 hours to remove any air bubbles.

In a clean test-tube 0.01 grams of precursor are placed with the cooled steel boat.

The test-tube is attached to a vacuum line and heated to 400 °C (Zone 1) directly above the slides and ~30 minutes later heated to 60 - 80°C (Zone 2) above the precursor.

Sample is placed in a furnace and heated to >1100 °C for a few hours and slowly cooled to room temperature.

Stoichiometric amounts of Fe-P are placed in a niobium tube and welded under Argon gas.
Chemical Vapor Deposition vs. Sol–gel synthesis

- Chemical Vapor Deposition
  - Used to produce thin films
  - Low temperature
  - Synthesis of a pure phase

- Sol–gel Synthesis
  - Consists of a solution and a gel phase
  - A wet chemical technique
  - Low temperature synthesis
  - Can be used to form thin films by dip coating or spin coating
Classify each of the following under the category of chemical vapor deposition or made from titanium dioxide.