**Literature review plan**
Plan out your research with this helpful literature review plan, apply these strategies to your own work by filling out your answers to the questions below.

**Themes**
What central themes have you identified in the field of research?

* Ammonia is both an energy source and an environmental pollutant – need to both store as well as capture; demand is rising
* Current methods of ammonia capture such as precipitation, permeable membranes are energetically expensive, costly, and difficult to maintain
* Porous materials for ammonia capture has shown promising potential
* Porous materials though having potential, not yet suitable for industry – need more research. Where and how about should we go ahead with this research?

**Debates and disagreements**What are the main debates and disagreements in the research?

**FOR**

* Porous materials are showing potential to replace common industrial routes.
* This would provide potential to reduce energy costs, improve efficiency and overall process of ammonia capture and storage.

**AGAINST**

* Progress is also being observed in the already industrial routes.
* Research is expensive – does the research costs associated with investigating porous materials for years counter the costs associated with improving current techniques.

**Research chronology**Show how the research field has development over time.

1. Industrial ammonia capture and storage methods developed, such as precipitation through formation of ammonium sulfate, using permeable membranes and bio fixation.
2. Need for new technologies and routes identified. Porous materials to the picture, and zeolites, alumina and silica researched first.
3. Above porous materials showed low adsorption capacity. Further research developed polymers, metal organic frameworks, metal organic squares and inorganic composites, which showed high adsorption capacity, but sometimes low structural stability.
4. Potential is clear. Need to think of routes to improve both adsorption capacities and structural stabilities.

**Key researchers**Who are the key researchers in the field? What was their contribution?

1. Sihai Yang, University of Manchester
* Development of robust stable porous metal organic frameworks for ammonia capture, currently holds the record for the most stable metal organic framework for this application.
1. Long and co – workers
* Development of acidic porous polymers showing high stability and high adsorption capacities, one of the best performing porous materials recorded so far.
1. Hong and co – workers, Korea University
* Holds the world record for the porous material (metal organic framework) with highest adsorption capacity.

**Gaps in the research**What gaps or weakness are there in the research field?

* There is currently no proper evidence on what the factors are affecting the high adsorption capacities and stabilities of porous materials – this is the main aim of this review.
* There is no progress in some areas, despite showing potential, for example, in porous dyes used for ammonia adsorption – why is this the case and why hasn’t it been investigated much is not looked upon.
* The current methods used for ammonia capture and storage is also developing – these routes are however still not that well received by the scientific community – why is this the case?
* Are there any other materials that are suitable for ammonia adsorption? Only more recently many existing porous materials were investigated, such as metal organic squares and hydrogen bonded organic frameworks.