Jupiter's Great Red Spot is Composed of Ammonia and Phosphine

Erika Rosenberger
Parkland College

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**Erika Rosenberger**

**Parkland College CHE 205**

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**Facts About The Great Red Spot**

- **12,400 miles (20,000 kilometers) long and 7,500 miles (12,000 km) wide.**
- **Wind at edges: 425 miles per hour.**
- **First documented in 1831.**
- **composed mainly of three chemicals:**
  - Ammonia (NH₃)
  - Phosphine (PH₃)
  - Para-Hydrogen (para-H₂)

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**Phosphine**

- Chemical reaction occurs in the Great Red Spot.
- Why they are red.
- Problem with this reaction sequence.
- Phosphine was too big.
- Most abundant at 600 mbar.
- Missing reaction.
- Phosphorus reacts with ammonia to form phosphorus hydride.
- Difference in pressure and temperature dependence.

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**Ammonia**

- Local maximum.
- Depressed by a complex interactions.
- Helps cloud formation.
- Useful to scientists.
- Most abundant in the regions around 400-500 mbar.
- Dissociates in zones above 600 mbar.

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**Para-hydrogen**

- Ortho-hydrogen
- Parahydrogen

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**Conclusion**

- In Jupiter’s Great Red Spot, ammonia, phosphine, and para-hydrogen were found. The Great Red Spot is the local maximum of ammonia, the most abundant component of the atmosphere. The abundance of ammonia in the Spot is regulated by a complex interaction between photolysis, condensation, precipitation, and atmospheric dynamics. Ammonia is found most abundant in the regions around 400-500 mbar when phosphine is the most abundant at 600 mbar. The photodissociation reaction of phosphine that occurs in the Spot helps explain why the planet Jupiter and the Great Red Spot is red. The reaction sequence proposed by scientists Prinn and Lewis had some faults. Many different researchers explained how the reaction sequence could be changed to accommodate the data and observations.

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**Prinn and Lewis: Phosphine to Red Phosphorus**

\[ \text{PH}_3 + h\nu \rightarrow \text{H} + \text{PH}_2 \]

\[ \text{PH}_3 + \text{PH}_2 \rightarrow \text{PH} + \text{PH}_2 \]

\[ \text{PH} + \text{PH} \rightarrow \text{P} + \text{H}_2 \]

\[ \text{H} + \text{H} \rightarrow \text{H}_2 \]

\[ \text{P} + \text{P} \rightarrow \text{P}_2 \]

\[ \text{P}_2 + \text{M} \rightarrow \text{P}_3 + \text{M}_2 \]

\[ \text{P}_4 - \text{P}_2(s) \]

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**Missing Abstraction Reaction**

\[ \text{H} + \text{PH}_3 \rightarrow \text{H}_2 + \text{PH}_2 \]

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**References**

- Huffington Post. [http://www.huffingtonpost.com/2013/03/10/jupiter-great-red-spot_a_2815383.html](http://www.huffingtonpost.com/2013/03/10/jupiter-great-red-spot_a_2815383.html)