WHAT IS CLAIMED IS:

1. A method of removing chlorides from a plastics pyrolysis stream comprising an initial chloride concentration of greater than about 10 ppmw, the method comprising:

contacting the stream with an alumina adsorbent, the alumina adsorbent comprising a promoter comprising sodium, wherein a final chloride concentration of the treated stream is less than about 10 ppmw.

2. The method of claim 1, wherein the initial chloride concentration is from about 10 ppmw to about 45 ppmw or from about 45 ppmw to about 250 ppmw.

3. The method of claim 1, wherein the promoter is present from 2 wt% to about 10 wt% based on the total weight of the adsorbent.

4. The method of claim 3, wherein the promoter comprises the sodium in the form of Na_2O.

5. The method of claim 1, wherein the alumina adsorbent has a total pore volume from about 0.2 mL/g to about 6 mL/g.

6. The method of claim 1, wherein the alumina adsorbent exhibits a bimodal pore size distribution.

7. The method of claim 1, wherein the alumina adsorbent is in the form of spherical particles exhibiting a side crush strength of greater than about 40 N.

8. The method of claim 1, wherein a chlorides removal ratio is at least about 80% for a temperature of the pyrolysis stream from 200°C to 350°C.

9. A method of removing chlorides from a plastics pyrolysis stream comprising an initial chloride concentration of greater than about 10 ppmw, the method comprising:

contacting the stream with an adsorbent, the adsorbent comprising copper oxide, zinc oxide, and alumina, wherein a final chloride concentration of the treated stream is less than about 10 ppmw.

10. The method of claim 9, wherein the copper oxide is present from about 50 wt% to about 80 wt% based on the total weight of the adsorbent.

11. The method of claim 9, wherein the zinc oxide is present from about 20 wt% to about 30 wt% based on the total weight of the adsorbent.

12. The method of claim 9, wherein:

the copper oxide is present from about 50 wt% to about 80 wt%;

the zinc oxide is present from about 10 wt% to about 40 wt%; and

the alumina is present as the balance of the weight of the adsorbent.

13. The method of claim 9, wherein the adsorbent has a BET surface area of about 25 m^2/g to about 150 m^2/g.

14. The method of claim 9, wherein the adsorbent has a total pore volume from about 0.15 mL/g to about 2 mL/g.

15. The method of claim 9, wherein the adsorbent is in the form of tablets exhibiting a side crush strength of greater than about 60 N.

16. The method of claim 9, wherein a chlorides removal ratio is at least about 80% for a temperature of the pyrolysis stream from 200°C to 350°C.