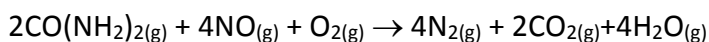


Answer on Question #81516 – Chemistry – General Chemistry

The emission of NO_2 by fossil fuel combustion can be prevented by injecting gaseous urea into the combustion mixture. The urea reduces NO (which oxidizes in air to form NO_2) according to the following reaction:



Suppose that the exhaust stream of an automobile has a flow rate of 2.42 L/s at 661 K and contains a partial pressure of NO of 14.0 torr

What total mass of urea is necessary to react completely with the NO formed during 9.0 hours of driving?

Solution:

9.0 hours \times 3600 seconds / hour = 32400 seconds

32400 seconds \times 2.42 L/s = 78 408 Litres of NO

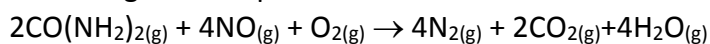
Find the moles of NO using the ideal gas law:

$$PV = nRT$$

$$(14 \text{ Torr}) \times (78\,408 \text{ Litres}) = n \times (62.36 \text{ L}\cdot\text{Torr}/\text{mol}\cdot\text{K}) \times (661\text{K})$$

$$n = 26.63 \text{ moles of NO}$$

According to the equation



4 moles of NO reacts with 2 moles of urea,

which, using molar mass, is

$$2 \text{ mol urea} \times 60.06 \text{ g/mol} = 120.12 \text{ grams}$$

so

$$26.63 \text{ moles of NO} \times (120.12 \text{ grams urea}) / (4 \text{ mol NO}) = 800 \text{ grams of urea}$$

Answer provided by www.AssignmentExpert.com