Answer on Question #62387 - Chemistry - General Chemistry

Question

When hydrocarbons are burned in a limited amount of air, both CO and CO_2 form. When 0.410 g of a particular hydrocarbon was burned in air, 0.425 g of CO, 0.668 g of CO_2, and 0.410 g of H_2O were formed.

1) How many grams of O_2 were used in the reaction?

2) How many grams would have been required for complete combustion?

Solution:

1) Using the Low of conversation of mass:

$m(C_xH_y) + m(O_2) = m(CO) + m(CO_2) + m(H_2O)$

$m(O_2) = m(CO) + m(CO_2) + m(H_2O) - m(C_xH_y) = 0.425 + 0.668 + 0.410 - 0.410 = 1.093$ (g)

2) If we want to complete combustion, we need to oxidize CO to CO_2

$2CO + O_2 = 2CO_2$

$m_{add}(O_2) = M(O_2)\cdot\vartheta(O_2) = M(O_2)\cdot\vartheta(CO)/2 = M(O_2)\cdot\frac{m(CO)}{2M(CO)} = 32\cdot\frac{0.425}{2\cdot 28} = 0.243$ (g)

$m_{total}(O_2) = m(O_2) + m_{add}(O_2) = 1.093 + 0.243 = 1.336$ (g)

Answer: 1) $m(O_2) = 1.093$ (g) were used in the reaction

2) $m(O_2) = 1.336$ (g) would have been required for complete combustion