Answer on Question #55563 – Chemistry - General chemistry

Question:

A piece of chromium metal with a mass of 24.26 g is heated in boiling water to 98.3 degrees celsius and then dropped into a coffee-cup calorimeter containing 82.3 g of water at 23.3 degrees celsius. when thermal equilibrium is reached, the final temperature is 25.6 degrees celsius. Calculate specific heat capacity of chromium.

Answer:

In the considered system the energy sent is equal to the energy received.

$$Q = C \cdot m \cdot \Delta T$$

$$C_{(water)} \cdot m_{(water)} \cdot \Delta T_{(water)} = C_{(\text{chromium})} \cdot m_{(chromium)} \cdot \Delta T_{(chromium)}$$

Where C – specific heat capacity for the material, J/(g·K);

m – mass of the material, g;

ΔT – temperature difference of the material, K.

$C_{(water)}$ = 4.1813 J/(g·K)

$$C_{(\tilde{n}hromium)} \cdot 24.26 \cdot ((98.3+273)-(25.6+273)) = 4.1813 \cdot 82.3 \cdot \left((25.6+273)-(23.3+273)\right)$$

$$C_{(\tilde{n}hromium)} = \frac{4.1813 \cdot 82.3 \cdot \left((25.6+273)-(23.3+273)\right)}{24.26 \cdot ((98.3+273)-(25.6+273))} = 0.45 \frac{J}{g \cdot K}$$