

## 6.2) Enthalpy and Calorimetry

Study of the heat of a reaction or change in enthalpy,  $\Delta H$

$$\text{Change in enthalpy: } \Delta H = H_{\text{products}} - H_{\text{reactants}}$$

**Calorimetry:** the science of measuring heat

$$q = C_p \times m \times \Delta T$$

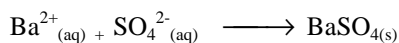
$q$  is heat in Joules. Extensive property

$C_p$ , heat capacity. Amount of heat energy required to raise 1 gram  $1^\circ\text{C}$

$m$ , amount of substance in grams

$\Delta T$ , change in  $^\circ\text{C}$  (or Kelvins). Intensive property

**Ex** 50.0 ml L of 1.00M  $\text{Ba}(\text{NO}_3)_2$  solution at  $26.5^\circ\text{C}$  is added to 50.0 ml of 1.00 M  $\text{Na}_2\text{SO}_4$  at  $25^\circ\text{C}$ . The white solid  $\text{BaSO}_4$  forms and the temperature rises to  $28.1^\circ\text{C}$ . Assuming that the calorimeter absorbs no heat, that the solution has a heat capacity of  $4.18 \text{ J/g}^\circ\text{C}$ , and that the solution has a density of  $1.0 \text{ g/ml}$ , calculate the enthalpy change per mole of  $\text{BaSO}_4$  formed.



$$q = (4.184 \text{ J/g}^\circ\text{C}) (50.0 + 50.0\text{g}) (28.1 - 26.5^\circ\text{C}) = -669 \text{ J}$$

$$\text{mol} = (0.0500 \text{ L} \times 1.00 \text{ M}) = 0.0500 \text{ mol } \text{Ba}^{2+} = \text{mol } \text{SO}_4^{2-} = \text{mol } \text{BaSO}_4$$

$$\Delta H = -669 \text{ kJ} / 0.0500 \text{ mol} = 13.4 \text{ kJ/mol}$$

### Constant Pressure Bomb calorimeter and Calorimeter Constant

Done at constant volume so  $\Delta E = q$

Calorimeter constant is a value for the calorimeter and all of its parts, expressed as  $\text{kJ}^\circ\text{C}$

### Ex. P.242 Sample Ex. 6.6

**In Class:** P.267 #31, 32, 33, 34, 35, 39

**Homework:** P.268 #36, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56