can be applied to form framework **22** from framework **12** with framework **22** including complexes **13** having metal portions **25** (M^y). Upon changing at least some of the oxidation state of M^X to M^y, at least some of guest material **32** dissociates or desorbs from framework **22** as substantially pure guest material **32**. Accordingly, a method for releasing associated guest materials from a metal organic framework is provided with the method including altering the oxidation state of at least a portion of the metal of the metal organic framework to dissociate at least a portion of the guest materials from the framework. Referring to **3**(C), V_1 can be applied to again substantially form framework **12** from framework **22** with framework **12** including complexes **13** having metal portions **15** (M^X). Upon returning the oxidation state of M^y to M^X, mixture **30** can be exposed to framework **12** to associate or adsorb guest material **32** with or to framework **12**.

Referring to FIG. **4**, assembly **120** is shown that can be configured to transfer thermal energy. In accordance with example implementations, framework **22** can be configured to dissociate or desorb guest material **32**. Guest material **32** can be such a material that when it expands from the associated or adsorbed state it consumes energy in the form of heat from its surroundings. Accordingly, guest material **32** can be provided to a heat transfer assembly such as a mass of coils **122** being configured to be exposed to fluid **124**. Accordingly, temperature T_1 of guest material **32** can be less than temperature T_2 of guest material **32** after it passes through exchanger **122**. Further, fluid **124** can have a temperature T_3 that is greater than temperature T_4 after being exposed to coils **122**. In accordance with example implementations, framework **22** can include associated or adsorbed guest material such as a refrigerant or carbon dioxide; V_1 can be altered to change the oxidation state of the metal of the metal organic framework thereby dissociating or desorbing guest material from the framework. Upon dissociation the guest material can be allowed to expand via valve **126**, such as a throttling valve, and be provided to coils **122** wherein the guest material cools fluid **124**, such as air or water, for example. In accordance with example implementations, guest material **32** upon passing through exchanger **122** may be provided to another metal organic framework configured to associate or adsorb the guest material.

Accordingly, thermal energy transfer assemblies of the present disclosure can include a metal organic framework electrically coupled to a power source, and a heat transfer assembly associated with the metal organic framework. In accordance with specific implementations, the assemblies can further include a controller (not shown) operatively coupled to the metal organic framework and the power source. Additionally, the assembly can include another metal organic framework coupled to the heat transfer assembly, with the metal of one organic framework having an oxidation state different than the metal of the other organic framework.

Referring to FIG. **5**, system **130** is shown generally depicting components of an adsorption chiller. Referring first to (A), guest materials **32** such as a carbon dioxide can be dissociated or desorbed upon providing V_2 to framework **22**. During this dissociation or desorption fluid **124** can be exposed to the thermal energy of framework **22**. In accordance with example implementations, framework **22** can be supported by a thermally conductive material and configured along the outside of a conduit containing fluid **124**. Fluid **124** can be cooled as it passes through this conduit and utilized as desired. Further, guest material **32** can be allowed to condense.

Referring next to (B), guest material **32** can be allowed to at least partially evaporate and associate or adsorb to framework **12** at V_1. During adsorption, framework **12** can increase in temperature and this thermal energy may be provided to fluid **130** as it is exposed to framework **12**. In accordance with example implementations, framework **12** can be configured along the outside of a conduit containing fluid **130** to facilitate the heat transfer. Accordingly, the temperature of fluid **130** upon being exposed to framework **12** can be greater than before it was exposed to framework **12**. Accordingly, assembly **130** can be configured as an adsorption chiller. In accordance with example implementations, the adsorption chiller of assembly **130** includes an electrochemically driven desorption and/or adsorption cycle.

Accordingly, methods for transferring thermal energy are provided with the methods including adsorbing or desorbing guest materials to or from a metal organic framework. The adsorbing or desorbing can be facilitated by changing an oxidation state of at least some of the metal within the metal organic framework. The methods can include providing thermal communication between a fluid and one or both of the metal organic framework or the guest materials. The fluid can change temperature upon communication with the one or both of the metal organic framework or the guest materials. According to example implementations, the providing thermal communication between the metal organic framework and the liquid can include providing a conduit having an exterior in thermal contact with the metal organic framework, and providing the fluid within the conduit.

In compliance with the statute, embodiments of the invention have been described in language more or less specific as to structural and methodical features. It is to be understood, however, that the entire invention is not limited to the specific features and/or embodiments shown and/or described, since the disclosed embodiments comprise forms of putting the invention into effect.

The invention claimed is:

1. A thermal energy transfer assembly, the assembly comprising:

one metal organic framework electrically coupled to a power source;

a heat transfer assembly associated with the metal organic framework; and

another metal organic framework coupled to the heat transfer assembly, the metal of the one metal organic framework having an oxidation state different than the metal of the other organic framework.

2. A thermal energy transfer assembly, the assembly comprising:

a metal organic framework electrically coupled to a power source;

a heat transfer assembly associated with the metal organic framework;

a conduit extending between the metal organic framework and the heat transfer assembly; and

a throttling valve between the metal organic framework and the heat transfer assembly.

3. The assembly of claim **2** further comprising a controller operatively coupled to the metal organic framework and the power source.

4. The assembly of claim **1** further comprising another heat transfer assembly associated with the other metal organic framework.

5. The assembly of claim **4** wherein the assembly is configured as an adsorption chiller.

6. A method for transferring thermal energy, the method comprising:

adsorbing or desorbing guest materials to or from a metal organic framework, the adsorbing or desorbing facili-