Name _____ Date _____ Class _____

RESEARCH NOTE

Phase-Change Materials

The real estate ad of tomorrow could read like this:

Just listed! Perfect starter home! Two bedrooms, 2 1/2 baths, walk-in closets, heats and cools itself with minimal electricity or other power.

Ival Salyer, a senior research scientist at the University of Dayton Research Institute, says that homes like these may soon be commonplace. Phase-change technology will help control indoor temperature with walls that melt or freeze a bit as the weather changes.

When any material goes through a change in its physical form or state, it releases or absorbs heat. Salyer has designed walls that work on this principle. The wallboards are filled with a type of paraffin that melts or freezes above or below 75°F. When the temperature outside rises above 75°F, the paraffin melts and absorbs the heat inside the house. The opposite happens when the outdoor temperature drops. This change of state keeps the temperature of a house comfortably constant while using little power other than the heat of the sun.

By heating the material with electricity overnight, heat could be stored by changing the paraffin in the walls to a liquid state. When the heat is discontinued, the walls would freeze, radiating heat into the house and keeping it warm all day. Shifting the heating and cooling loads to off-peak nighttime hours is of strong interest to utility companies, which offer off-peak discounts to encourage the use of surplus nighttime power.

According to Salyer, because state change is an inherent property of matter, the walls heat and cool automatically, with no need for monitoring by people and no degradation from wear.

Another recent discovery that can dramatically reduce building, heating, and cooling costs is the use of molded inserts of phase-change materials in the hollow spaces of hollow-core concrete blocks. In the outside walls of buildings, this phase-change material can store warmth from the winter sun for heating and the coolness of a summer night for cooling.

Salyer foresees this technology being used in dozens of other applications. Phase-change material is already being marketed as a food warmer; after being microwaved for a few minutes, a pillow-like pad can release heat for hours. The same idea is being adapted for use with bowls and plates to keep food warm. Winter weather might not feel quite so harsh with phase-change material lining coats, hats, and gloves.

Phase-change flowerpots could keep plants warm, and the asphalt of highway bridges and liners for car batteries could be protected from freezing with the use of phase-change materials. Phase-change uniforms for firemen and soldiers could keep them comfortably cool, and the material could be used as a protective, heat-resistant coating around airplane fight-data recorders and cockpit voice recorders.