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Abstract: The article reports that researchers in France have discovered a liquid mixture that freezes into a waxy crystalline solid when heated. It appears to be the first solution to exhibit an abnormal heat-induced transition from liquid to solid rather than the other way around, report Hans-Peter Trommsdorff of Joseph Fourier University in Grenoble and his colleagues. The scientists created the surprising substance by mixing alpha-cyclodextrine--whose molecules are loops made of six glucose molecules--with water and the common, foul-smelling organic solvent 4-methylpyridine. The team's computer simulations suggest why solidification occurs at the transition from cooler liquid to warmer solid. Some weak intermolecular attractions, called hydrogen bonds, which ordinarily would strengthen links between the glucose components of alpha-cyclodextrine become disrupted. This allows new hydrogen bonds to form between the solution's different constituents.

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PHYSICS

To freeze this liquid, add heat

Researchers in France have discovered a liquid mixture that freezes into a waxy crystalline solid when heated. It appears to be the first solution to exhibit an abnormal heat-induced transition from liquid to solid rather than the other way around, report Hans-Peter Trommsdorff of Joseph Fourier University in Grenoble and his colleagues. They detail the finding in the Sept. 15 Journal of Chemical Physics.

The scientists created the surprising substance by mixing alpha-cyclodextrine-whose molecules are loops made of six glucose molecules-with water and the common, foul-smelling organic solvent 4-methylpyridine.

At room temperature, about 20°C, the mixture is a clear liquid. It transforms into a milky

white block at a temperature between 45°C and 75°C, depending on the proportions of the mixture's ingredients. This is not a gelling effect, the researchers say.

"There's no chemical change," notes physical chemist Ralf Schweins of the Laue-Langevin Institute in Grenoble, a member of the research team. "When you cool it down, it becomes a liquid again." Tests also indicate that the heat-formed solid reliquifies when heated above approximately 95°C, the team reports.

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By P. W.

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