Fast-tracking the manufacture of glasses

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Old glass is not the same as new glass -- and the difference is not just due to manufacturing techniques. Unlike crystalline solids, glasses change as they age, increasing packing density and stability. Ideally, a glass should be cooled slowly, maybe over 10,000 years or so, but that is not usually practical.

Research reported in the Journal of Chemical Physics details the production of highly stable glass films of indomethacin by physical vapor deposition. Researchers used alternating current nanocalorimetry to evaluate the heat capacity of the thin glass films. Heat capacity provides a way to probe the fundamental structure of the solid because it is related to particle vibrations. Heat capacity values were observed that are the equivalent to significantly aged conventional glasses.

"We like to call these glasses 'impossible materials' because their properties match things that would take a million years to manufacture using conventional techniques," says author Mark Ediger. The research is an international collaboration combining "interesting materials" from the University of Wisconsin-Madison and a "cool technology" from the University of Rostock, Germany.

Ediger sees potential application of these techniques in manufacturing organic electronic devices such a photovoltaics. Current devices tend to wear out faster than manufacturers would like. "I am optimistic that we are learning to manipulate properties in a predictable way," he says. "If we can make an organic electronic material in ten minutes that would otherwise take a million years to prepare, we can manufacture things that

people would not have considered before."

More information: The article, "Observation of low heat capacities for vapor-deposited glasses of indomethacin as determined by AC nanocalorimetry" by Kenneth L. Kearns et al will appear in the Journal of Chemical Physics. See: jcp.aip.org/

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