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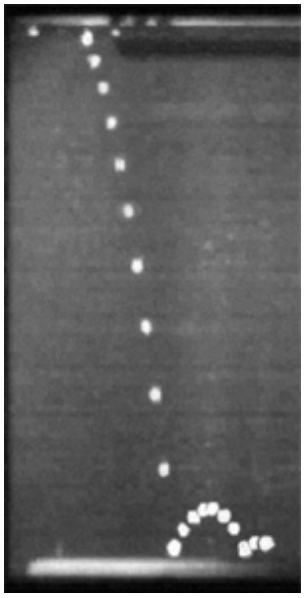
EMSL In Brief
Environmental Molecular Sciences Laboratory

"Sticky Ice" Research at EMSL Receives National Attention

How dust specks in the early solar systems came together to become planets has proved challenging to astronomers for years. Gravity, always an attractive candidate to explain how celestial matter pulls together, was no match for stellar winds. The dust needed help coming together fast, in kilometer-wide protoplanets, in the first few million years after a star was born, or the stellar wind would blow it all away.



The cushioning feature of extreme low-temperature ice is a key attribute in planet formation.

Researchers at EMSL, reporting in the current issue of *Astrophysical Journal*, offer an answer to the planet- formation riddle: Micron-wide dust particles encrusted with molecularly gluey ice enabled planets to bulk up like dirty snowballs quickly enough to overcome the scattering force of solar winds.

"People who had calculated the stickiness of dust grains found that the grains didn't stick," said James Cowin, PNNL Laboratory Fellow who led the research. "They bounce, like two billiard balls smacked together."

The research has been featured in a number of science and media outlets since the paper's publishing, including Discovery and MSNBC. A brief of the research will also appear in the April issue of Physics Today.

"This ice is very different from the stuff we chip off our windows in winter," Cowin said. "For example, we saw that at extreme cold temperatures vapor-deposited ice spontaneously becomes electrically polarized. This makes electric forces that could stick icy grains together like little bar magnets."

Cowin's team has spent years studying, among other things, the chemical and physical properties of atmospheric dust and water ice, using an array of instruments suited to the task at EMSL.

Full text of the PNNL-level press release on the research is available online.

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