

Teacup Rocket Experiment (T-Rex)

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ABSTRACT

The Teacup Rocket Experiment (T-Rex) is a project being carried out by a group of five SpaceMaster students at Luleå Tekniska Universitet, Kiruna, Sweden. The objective of T-Rex is to investigate the effectiveness of the 'electric tempest in a teacup'^[1] method for microfluidic separation, in microgravity environments. Similar to the leaves in a teacup collecting at the centre while stirring, rotation is induced to trap particles of a microfluidic suspension (such as diluted blood) using a probe emitting an ionic wind to propel the fluid. This is done by applying a high voltage to the probe, which causes a corona discharge due to ionization of the air around the electrode tip.

The major advantages of this method over traditional fluid separation methods in space applications are the tiny size of the working units, small sample size required for effective separation, low power consumption and lack of moving parts. Microfluidic separation experiments using the electric-tempest-in-a-teacup method have been conducted in laboratory conditions. However, the results are distorted by the presence of dominant gravity forces on the Earth. There is need for testing the technique in space or microgravity conditions in order to understand the effectiveness of this method in space. A possible application of this method is in portable on-board diagnostic devices to monitor astronauts' health in long-duration spaceflights.

[1] I. Yeo, L Y, Friend, J R, Arifin, D R, "Electric tempest in a teacup: The tea leaf analogy to microfluidic blood plasma separation", Applied Physics Letters 89, 103516 (2006)