**Continuous Size-Dependent Separation of Microspheres in Human Whole Blood in Microﬂuidic Cascading Spirals**

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Fluid ﬂow in a curved duct consists of a primary ﬂow directed in the duct’s centerline and a secondary one within the duct’s cross section. The latter consists of the two counter-rotating Dean vortices [1, 2]. The ﬂow of a colloidal suspension through such a duct will size-dependently align the initially homogeneously suspended particles along an equilibrium position close to the inner wall, shown in **Figure 1**. Microﬂuidic spirals make use of this effect for separating distinct size fractions from a binary ﬂuid in a continuous process at sample volumes of approximately 1 mL [3].

A microﬂuidic device is investigated to separate and thereby concentrate rare components in human whole blood, such as parasites, to facilitate their detection. The device is a polymer cast made of polydimethylsiloxane (PDMS) and due to its low fabrication costs it is especially advantageous for applications in Africa. Microspheres, suspended in the blood samples in the present investigations substitute the parasites, and vary in their size distribution. A variation of the spirals geometry and the volume rate in the channel inﬂuences the separation dynamics and is investigated experimentally as well as numerically by computational ﬂuid dynamics. The separation process by Dean forces described above can lead to an even higher concentration of the rare component by using a continuous system of two or more spirals in a row.

 [1] WR Dean (1927) Phil Mag **4**, 208-223; [2] WR Dean (1928) Phil Mag **5**, 673-695; [3] S Dutz et al. (2012) JMMM **324**, 3791-3798

 

**Figure 1**: Particles’ equilibrium position [3]. **Figure 2**: Blood ﬂow in PDMS-microchip.