In one embodiment the stirrer system has a Newton number of from 5.5 to 8.0 at a Reynolds number of from $5*10^4$ to $5*10^5$. In another embodiment the stirrer system has a mixing time $\Theta_{0.95}$ of about 20 seconds at a power input of about 0.05 W/kg and of about 10 seconds at a power input of about 0.3 W/kg.

Another aspect as reported herein is a device having~~comprising~~ a stirrer system ~~as reported herein~~ and a cultivation vessel~~.~~, the stirrer system consisting of two radially-conveying stirrer elements and one axially-conveying stirrer element arranged above one another on a vertical stirrer shaft, wherein the axially-conveying stirrer element is arranged above the radially-conveying stirrer elements. In one embodiment the device further comprises a dialysis module. In another embodiment the device is for the culturing of animal cells. In still another embodiment the device comprises

a) a cultivation vessel which is suitable for receiving a cultivation medium and animal cells to be cultured therein,
b) a shaft along the vertical axis of the cultivation vessel,
c) a stirrer system as reported herein attached to the shaft,
d) a gas inlet at the bottom of the cultivation vessel, and
e) at least one inlet in the upper portion of the cultivation vessel above the liquid surface for adding correcting and/or feeding solutions.

Also an aspect as reported herein is a method for producing a polypeptide comprising the following steps:

a) culturing a cell comprising a nucleic acid encoding the polypeptide in a cultivation vessel comprising a stirrer system as reported herein or a device as reported herein,
b) recovering the polypeptide from the cultivation medium or from the cells, and
c) purifying the polypeptide and thereby producing the polypeptide.

In one embodiment the purifying is a multistage chromatographic process. In another embodiment the purifying comprises an affinity chromatography, a cation exchange chromatography and an anion exchange chromatography.

Another aspect as reported herein is a method for culturing animal cells, characterized in that the animal cells are cultured in a cultivation vessel comprising a stirrer system as reported herein or a device as reported herein.

In one embodiment the culturing is a semi-continuous culturing. In a further embodiment the semi-continuous culturing is a dialysis. In one embodiment the polypeptide is an antibody or an antibody derivative.

A further aspect as reported herein is the use of a devicestirrer system as reported herein for the mixing of animal cell cultivation medium. In one embodiment of the previous aspects the cultivation medium is an aqueous medium which is suitable for the cultivation of prokaryotic and eukaryotic cells. In another embodiment the cultivation medium is a Newtonian liquid. In one embodiment the stirrer system is operated at a power input of from 0.01 W/kg to 1 W/kg. In a further embodiment the stirrer system is operated at a power input of from 0.04 W/kg to 0.5 W/kg. In still another embodiment the flow induced by the stirrer system in the cultivation medium is a turbulent flow. In another embodiment the cultivation medium has a viscosity of 3 mPas*s or less. In another embodiment the viscosity is 2 mPas*s or less.

A further aspect as reported herein is the use of the stirrer system for culturing animal cells or hybridoma cells for the production of polypeptides or antibodies. In one embodiment the culturing is carried out in a submersed gassed stirred tank reactor. In another embodiment the animal cell is a mammalian cell. In yet a further embodiment the cell is a CHO cell, a BHK cell, an NS0 cell, a COS cell, a PER.C6 cell, a Sp2/0 cell, an HEK 293 cell or a hybridoma cell. In yet a further embodiment the antibody is an antibody against CD19, CD20, CD22, HLA-DR, CD33, CD52, EGFR, G250, GD3, HER2, PSMA, CD56, VEGF, VEGF2, CEA, Lewis Y antigen, IL-6 receptor, or IGF-1 receptor.

A further aspect as reported herein is a device for culturing animal cells, characterized in that the device comprises: a) a device as reported herein, b) a vertical shaft along the middle axis of the cultivation vessel, c) a gas feed at the bottom of the cultivation vessel, and d) at least one inlet in the area above the liquid surface for adding correcting and/or feeding solutions.

**Detailed description of the invention**

Reported herein is a stirrer system consisting of at least one radially-conveying element and at least one axially-conveying element, wherein at least three conveying elements must be present and whereby the uppermost element is an axially-conveying element. In comparison to stirrer systems that are currently used to culture shear-sensitive animal cells, the stirrer system as reported herein allows a more gentle and more rapid mixing of the cultivation medium. An example of a stirrer system as reported herein is shown in Figure 1. Thus, the stirrer system as reported herein provides for shorter mixing times and also for less stress imparted to the cultivated cells without the need of complex additional components such as baffles, static mixers, swirlers, draft tubes, or other means for directing the flow inside a cultivation vessel.

The terms "element" or "conveying element", which can be used interchangeably, denote a (functional) unit of stirrer blades which are in a fixed spatial configuration relative to one another with regard to distance and angle. A radially-conveying