It was found that surface functionalized polyethylene powder can be used for the sample preparation in microbial diagnostics. For example, this powder is dispersed in a large volume of a beverage and captures bacteria. Then the powder is removed by filtration. The relatively small amount of powder is compatible with the volume of analytes which are used in microbiological diagnostics. In this way 100 bacterial cells per liter beer can be detected. In a similar procedure the microbes can be insulated from e.g. soils samples.

The powder is functionalized in a two-step process including a plasma activation and the coupling of poly(ethylene imine) in a second wet chemical step. In a first approach the activation was performed in a 2 mm thick layer of the powder in a low-pressure MW plasma. Since the batch size of about 2 g resulted in a very low productivity, the first up-scaling lead to a RF powered fluidized bed reactor. The batch size was about 8 g. In a second up-scaling two commercial reactors with a rotating barrel were used with a batch size of ca. 100 g and an audio frequency and a radio frequency excitation, respectively.

In this presentation we will report our results of the comparison of the different activation approaches. It was found that for obtaining powders with the desired properties for the bacteria capturing requires a relatively high level of oxidation in the activation step. This level cannot be obtained by all the equipment. For example, the fluidized bed setup requires some technical tricks including pressure pulsing to obtain a powder with a homogeneous oxidation of a sufficient level. With an AF excitation in a rotating barrel system it is virtually impossible to prepare a product with a sufficient quality while in a RF powered system it is possible.

**Keywords**
- polymer powder
- surface functionalization
- biological diagnostics