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(54) **COAXIAL MICROREACTOR FOR PARTICLE SYNTHESIS**

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 271 days.

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(Continued)

**Related U.S. Application Data**

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(52) **U.S. Cl.**  
USPC ..... **436/180**; 436/174; 422/503; 422/502

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USPC ..... 436/174, 180; 422/50, 68.1, 82.05, 502, 422/503; 435/287.1  
See application file for complete search history.

**ABSTRACT**

A coaxial fluid flow microreactor system disposed on a microfluidic chip utilizing laminar flow for synthesizing particles from solution. Flow geometries produced by the mixing system make use of hydrodynamic focusing to confine a core flow to a small axially-symmetric, centrally positioned and spatially well-defined portion of a flow channel cross-section to provide highly uniform diffusional mixing between a reactant core and sheath flow streams. The microreactor is fabricated in such a way that a substantially planar two-dimensional arrangement of microfluidic channels will produce a three-dimensional core/sheath flow geometry. The microreactor system can comprise one or more coaxial mixing stages that can be arranged singly, in series, in parallel or nested concentrically in parallel.

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**21 Claims, 14 Drawing Sheets**

