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**Hu et al.**

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(54) **MAGIC ANGLE SPINNING NUCLEAR MAGNETIC RESONANCE APPARATUS AND PROCESS FOR HIGH-RESOLUTION IN SITU INVESTIGATIONS**

Y10T 436/24; G01R 33/307; G01R 33/46; G01R 33/48; G01R 33/30  
See application file for complete search history.

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(57) **ABSTRACT**

A continuous-flow (CF) magic angle sample spinning (CF-MAS) NMR rotor and probe are described for investigating reaction dynamics, stable intermediates/transition states, and mechanisms of catalytic reactions in situ. The rotor includes a sample chamber of a flow-through design with a large sample volume that delivers a flow of reactants through a catalyst bed contained within the sample cell allowing in-situ investigations of reactants and products. Flow through the sample chamber improves diffusion of reactants and products through the catalyst. The large volume of the sample chamber enhances sensitivity permitting in situ <sup>13</sup>C CF-MAS studies at natural abundance.

**16 Claims, 8 Drawing Sheets**

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