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[54] MICROWAVE PROCESSING

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[58] Field of Search 522/176, 174, 173; 528/353, 351, 125, 126, 128, 170, 188, 220, 229; 427/12, 45.1, 96, 124; 428/458, 473.5

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[57] ABSTRACT

A method and apparatus are disclosed for conducting a physical process and a chemical reaction by exposing a material containing a volatile substance to microwave radiation where the morphology of said material will change when exposed to such radiation. The power of said radiation is adjusted over time as the morphology of the material changes to maximize the effect of the radiation in order to produce a product in a minimum amount of time that is substantially free of said volatile substance.

The method and apparatus can also be used to conduct such a process or reaction with materials that do not contain a volatile material.

In one embodiment a method and apparatus are disclosed for manufacturing a polyimide from a precursor in a solvent by exposing the precursor to microwave radiation in a tuneable microwave resonant cavity that is tuned during imidization to achieve critical coupling of the system. Microwave power is controlled to remove the solvent and obtain the desired level of reaction. Processing time has been reduced thirty fold as compared to conventional thermal methods.

13 Claims, 4 Drawing Sheets