



(12) **United States Patent**
Wu et al.

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(54) **CERAMIC PARTICLES WITH CONTROLLED PORE AND/OR MICROSPHERE PLACEMENT AND/OR SIZE AND METHOD OF MAKING SAME**

USPC 507/269, 924; 166/280.1, 280.2;
264/628
See application file for complete search history.

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(56) **References Cited**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
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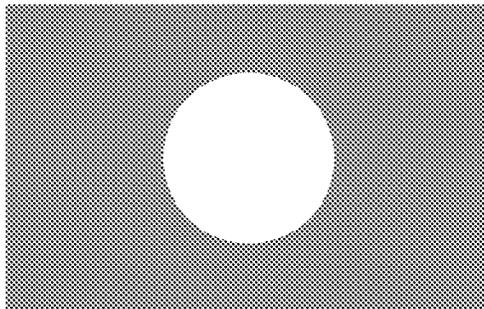
(58) **Field of Classification Search**
CPC C09K 8/80; Y10S 507/906; Y10S 507/924

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(57) **ABSTRACT**

The present invention relates to lightweight high strength
microsphere containing ceramic particles having controlled
microsphere placement and/or size and microsphere mor-
phology, which produces an improved balance of specific
gravity and crush strength such that they can be used in
applications such as proppants to prop open subterranean
formation fractions. Proppant formulations are further dis-
closed which use one or more microsphere containing
ceramic particles of the present invention. Methods to prop
open subterranean formation fractions are further disclosed.
In addition, other uses for the microsphere containing
ceramic particles of the present invention are further dis-
closed, as well as methods of making the microsphere con-
taining ceramic particles.

8 Claims, 6 Drawing Sheets



Pore in a glass-ceramic, ceramic, metal or composites thereof matrix.