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Ellison et al.

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(54) **OPAQUE COLORED GLASS-CERAMICS
COMPRISING NEPHELINE CRYSTAL
PHASES**

(58) **Field of Classification Search**
CPC C03C 10/0018
See application file for complete search history.

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(56) **References Cited**

U.S. PATENT DOCUMENTS

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2,933,857 A 4/1960 Stookey
3,146,114 A 8/1964 Kivlighn
(Continued)

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FOREIGN PATENT DOCUMENTS

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CN 102795779 11/2012
GB 869328 5/1961
(Continued)

OTHER PUBLICATIONS

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of the International Search Report and The Written Opinion of the
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Related U.S. Application Data

(57) **ABSTRACT**

(60) Provisional application No. 61/975,322, filed on Apr.
4, 2014.

Disclosed herein are opaque glass-ceramics comprising at
least one nepheline crystal phase and comprising from about
30 mol % to about 65 mol % SiO₂, from about 15 mol % to
about 40 mol % Al₂O₃, from about 10 mol % to about 20 mol
% (Na₂O+K₂O), and from about 1 mol % to about 10 mol %
(ZnO+MgO). Also disclosed herein are opaque-glass ceram-
ics comprising at least one nepheline crystal phase and at least
one spinel-structure phase doped with at least one colorant
chosen from transition metals and rare earth elements. Fur-
ther disclosed herein are methods for making these opaque
glass-ceramics.

(51) **Int. Cl.**
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(52) **U.S. Cl.**
CPC **C03C 10/0018** (2013.01); **C03B 32/02**
(2013.01); **C03C 3/085** (2013.01); **C03C 4/02**
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2204/04 (2013.01)

8 Claims, 8 Drawing Sheets

