

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
21 October 2004 (21.10.2004)

PCT

(10) International Publication Number
WO 2004/090942 A3

(51) International Patent Classification⁷: **C08K 3/08**,
C09J 4/02, 163/00, 163/02

(21) International Application Number:
PCT/US2004/009886

(22) International Filing Date: 30 March 2004 (30.03.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/458,944 1 April 2003 (01.04.2003) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
3 February 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: THERMALLY CONDUCTIVE ADHESIVE COMPOSITION AND PROCESS FOR DEVICE ATTACHMENT

(57) Abstract: Thermally conductive, sinterable, adhesive compositions, free of fugitive solvents, that include a powder of a relatively high melting point metal or metal alloy, a powder of a relatively low melting point metal or metal alloy powder and a thermally curable adhesive flux composition that comprises (i) a polymerizable fluxing agent; (ii) an inerting agent to react with the fluxing agent at elevated temperature, rendering it inert. The fluxing agent preferably comprises a compound with formula RCOOH, wherein R comprises a moiety having one or more polymerizable carbon-carbon double bonds. Optionally, the inventive compositions also include (a) a diluent that is capable of polymerizing with the fluxing agent's polymerizable carbon-carbon double bonds; (b) free radical initiators; (c) a curable resin; and (d) crosslinking agents and accelerators. The compositions can be applied directly onto the surfaces of devices to be joined mechanically and/or electrically and are ideally suited for semiconductor die attachment. During heating, the fluxing agent promotes wetting of the high melting point powder by the molten low melting point powder, causing liquid phase sintering of the powders. The fluxing agent also promotes wetting of the metallizations on the die and substrate by the molten low melting point alloy, providing improved thermal conductivity. Simultaneously, the fluxing agent itself crosslinks to further mechanically bond the adherent surfaces. The absence of fugitive solvents creates a void-free bond.



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