NASA TECH BRIEF

Langley Research Center

Diamine Curing Agents for Polyurethanes

Aromatic diamines are in demand as curing agents for converting isocyanates to polyurethanes with improved properties. Among the desired properties are higher adhesive strengths, higher softening temperatures, better toughnesses, and improved abrasion resistances. The reaction of an amine curing agent with an isocyanate end group results in a urea-type cross-link or chain-extending bond, which may account for some of the excellent properties.

There is also the requirement that the mixed polyurethane/diamine system have a sufficiently long pot life, or working time, during which time the fluid mixture can be poured or otherwise applied. The pot life cannot be too short, or the mixed system will gel (solidify) prematurely. On the other hand, excessive pot life is equally undesirable and leads to overly slow production cycles. Another important requirement is that the diamine must be sufficiently low melting so that it can be melted and poured into the fluid urethane prepolymer for rapid and uniform mixing.

Many aromatic amines can give the premium physical properties but, all too often, do not have the other necessary requirements. While 4,4′-methylene-bis-(2-chloroaniline) has all the desirable features necessary for a satisfactory diamine curing agent, it is expected that this diamine will not be used as extensively as in the past due to adverse physiological effects.

The search for other satisfactory curing agents has revealed three aromatic diamines which have several properties that make them promising candidates to replace 4,4′-methylene-bis-(2-chloroaniline). These diamines are 2,2′-diaminobenzophenone, 2,3′-diaminobenzophenone, and 2,4′-diaminobenzophenone. Their relatively low melting points lead to ease of mixing; the desirably low reactivities of the amine groups located ortho (adjacent) to the carbonyl group result in suitable pot lives; and the chemical nature of the benzophenone moiety results in excellent adhesion characteristics. This unique combination of properties makes these ortho-diaminobenzophenones a very promising group of diamines for use with polyurethane adhesive systems.

Note:

Requests for further information may be directed to:

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Patent status:

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