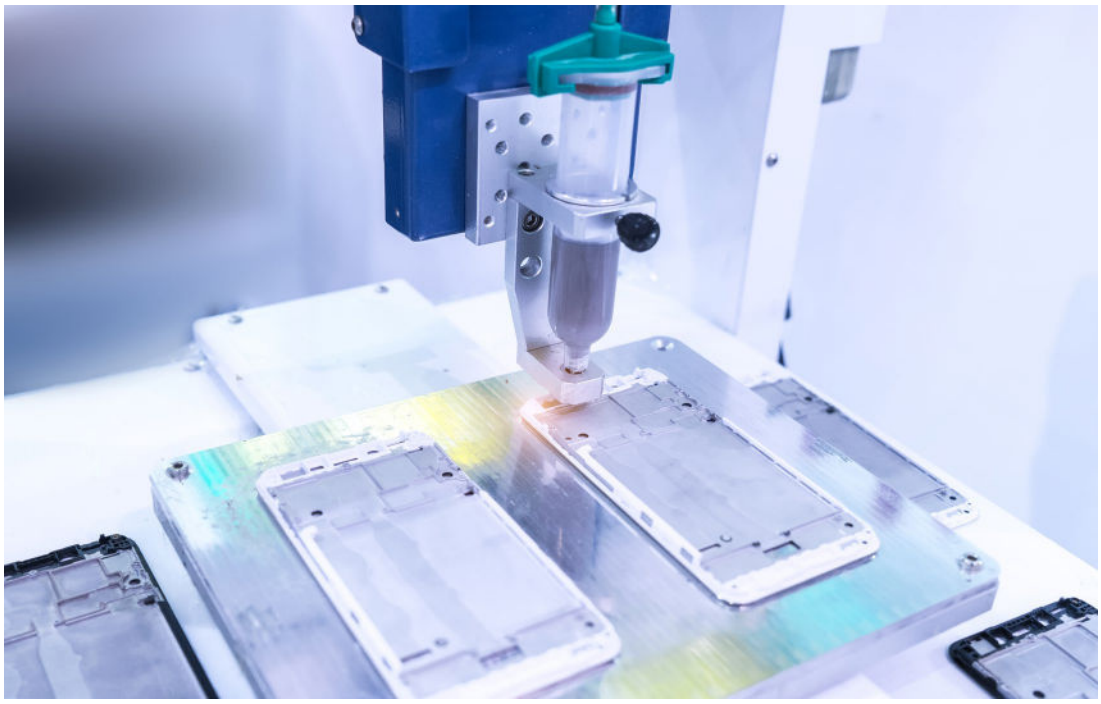
Resodyn™
ACOUSTIC MIXERS
Innovative Mixing Solutions

Advancements in Adhesives and Sealants Materials Made Possible By ResonantAcoustic® Mixing

Testimonials • Published Articles • Patents & Patent Applications



February 2022

This document is a portfolio of user testimonials, articles, and patents/patents pending that reference Resodyn's ResonantAcoustic® Mixing (RAM) technology in a variety of mixing pplications for adhesives and sealants. This collection of abstracts and links to published articles is intended to provide insight into the value of RAM technology as a means of solving challenges, improving quality, and raising productivity in the development and processing innovative adhesives and sealants.

Resodyn Acoustic Mixers, Inc. 130 N. Main Street, Suite 630, Butte, MT 59701
406-497-5333 I info@resodynmixers.com I www.resodynmixers.com

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Processing of Materials used in Adhesives and Sealants

Adhesives are a class of chemical compounds that enable different materials and surfaces to be bound together, making them all but impossible (or very difficult) to separate. They belong to a group of materials that are used to modify a solid surface in order to adhere to another solid surface. **Sealants** are chemical substances primarily used to prevent fluids or contaminant material from unintentionally passing through pipe or conduit joints, openings in materials, or through a surface. Sealants are either pliable or rigid, and may be permanent or temporary. Some sealants have adhesive characteristics.

Developers and manufacturers of Adhesive and Sealant products rely upon ResonantAcoustic® Mixing technology to deliver innovative new products in industries that span the globe.

= Locations of customers of ResonantAcoustic® Mixers

What organizations developing adhesive and sealant materials are saying about RAM

"…We were using reciprocal shakers to dissolve product we sampled off one of our high-volume production lines, and it was taking four hours just to prep the material for testing. Once we started using the LabRAM, it cut that time from four hours down to 20 minutes.""

- Global Synthetic Rubber Manufacturer

"...In laboratory-scale sensitivity testing, RAM materials were more homogenous with similar/slightly lower sensitivity than mix-muller produced materials.."

- SERDP Project WP-2631, 2020

RAM: 21st Century Mixing Technology for 21st Century Materials

More than a thousand RAM systems are in use in 33 countries around the world. RAM is the world's preferred choice for innovation in materials processing.

PUBLISHED ARTICLES

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Icon Legend

- RAM testing, evaluation
- Liquid/powder
- Adhesives
- Material/chemical properties
- Materials processing
- Sealants
- Powder/powder
- Materials/product quality

Icons	Publication Title (Live Links)*	RAM Application Summary	Year
	Safer Resonant Acoustic Mixing Methods for High-Volume Production of Pyrotechnics	"...the two-step RAM mix process was scaled from laboratory to concept scale (2-lb batch size) with no change in ignition sensitivity...[it was] demonstrated that RAM is a viable alternative to mix-muller mixers. Furthermore, projected benefits of a production-scale RAM process may result in significant increases to overall throughput, labor cost reduction of 61-96%, and a reduction in acetone used for cleanup operations by over 99%..."	2020
	Evaluation of resonant acoustic mixing performance	"...[an] investigation was carried out to study the mixing performance of a laboratory-scale ResonantAcoustic® Mixer (LabRAM). RAM can significantly reduce blending time, making it a good candidate for improving the efficiency of powder mixing processes."	2015
	Phase Change Activation and Characterization of Spray-Deposited Poly (vinylidene) Fluoride Piezoelectric Thin Films	"...The thickness of the thin film can play a role in the drying time necessary for complete solvent evaporation... To ensure dispersion of the Kynar resin in the solvent, the solution was placed in the LabRAM mixer from Resodyn Acoustic Mixers at 40% intensity at a speed of 60 Hz for a total of 30 s..."	2014
	ResonantAcoustic® Mixing–Processing and Formulation Challenges for Cost Effective Manufacturing	"... ResoantAcoustic® Mixing technology allows to obtain a better quality of the final mixtures in a reduced amount of time. Impacts on the mechanical, topographical and thermal properties of an epoxy inhibitor have been studied and the results show a significant decrease of the relative standard deviation of the ultimate tensile strength and the elongation at fracture when using the LabRAM mixer."	2009
	Resodyn unveils entirely new mixing technology	"...ResonantAcoustic® Mixing (RAM) promises solutions for many of the complications associated with conventional mechanical mixing: unwanted heat generation, due to excessive hydrodynamic shear stresses; long, inefficient mixing times; and impurities acquired during the transfer of products from mixing to shipping containers."	2007

PUBLISHED ARTICLES

Partial (edited) selection of searched technical articles using the following search terms (articles are live links): "resonant acoustic" "acoustic mixing" AND/OR: "Resodyn," "adhesive materials," "glues," "sealant materials."

Safer Resonant Acoustic Mixing Methods for High-Volume Production of Pyrotechnics
E Miklaszewski, MCM Yamamoto, MJT Dunham… - 2020 - serdp-estcp.org
… "Epoxy sample" refers to the material properties of the virgin cured epoxy system with no …
in full report) show that materials produced by the Resodyn methods pose no additional safety …

Related articles

Evaluation of resonant acoustic mixing performance
JG Osorio, FJ Muzzio - Powder Technology, 2015 - Elsevier
… curves" or blending profiles (the evolution of the variability in the concentration of the "critical" ingredient in the blend as a function of mixing … The fill level for all mixing parameters and materials used did not show significant effects on the mixing performance. Overall, the RAM is …

Related articles

Phase Change Activation and Characterization of Spray-Deposited Poly (vinylidene) Fluoride Piezoelectric Thin Films
MT Riosbaas - 2014 - search.proquest.com
… In order to remove any issues of the non-conductive adhesive, 3M copper-coated polyester cloth tape X-7001 was used, which contains … in the LabRAM mixer from Resodyn Acoustic Mixers at 40 % intensity at a speed of 60 Hz for a total of 30 s. Following mixing, the solution …

Related articles

ResonantAcoustic® Mixing–Processing and Formulation Challenges for Cost Effective Manufacturing
N Rumeau, D Threlfall, A Wilmet - 2009 - imemg.org
… of mixing on the materials. The main purpose of this paper is to analyze the effects of RAM
… of the topographical, mechanical and adhesive surface properties while minimizing the …
Related articles

Resodyn unveils' entirely new'mixing technology
G Ondrey - Chemical Engineering, 2007 - go.gale.com
… for previously prohibitive high-viscosity mixing. In one trial, a solid mixture of micron-sized powders was easily mixed with a viscous polymer resin at an 80 wt.% solids loading in approximately 2 min. Exhibiting a viscosity in excess of 80 McP, the material had been very difficult …

Related articles

Relevant Patents

Approved and pending applications for work involving the use of ResonantAcoustic® mixing technology.*

*Including patents with RAM as the preferred embodiment

Electrically conductive adhesive

Abstract
Disclosed herein is an electrically conductive adhesive composition, articles comprising at least two components adhesively bonded by the electrically conductive adhesive composition and methods of making such adhesives and articles. The electrically conductive adhesive composition includes milled carbon fibers dispersed in a thermosetting resin and a curative agent.

Solventless mixing process for coating pharmaceutical ingredients

Abstract
The present invention is a solventless method of producing polymer coated active pharmaceutical ingredient that is taste-masked and may be released in relatively short time. It employs high energy vibrations or acoustic mixing of API particles, water soluble coating material particles and hydrophobic polymer particles, with or without use of other pharmaceutically relevant powders as media. Additionally the method is capable of producing individually coated drug particles without agglomeration or the long drying times associated with solvent based coating methods.

Dental compositions

Abstract
A self-etching and self-adhesive dental restorative composition is described herein. The composition includes a polymerizable compound having at least one phosphorus containing acidic group, a polymerizable compound having at least one carboxylic acid group, and a copolymerizable multi-functional (meth)acrylate monomers. Compositions described herein demonstrate adhesion to dentin and enamel and are useful as a cavity filler, dental pit and fissure sealants, and restoratives.

RAM 5 *Continuous*

RAM 55

*Omni***RAM** *Continuous*

RAM 5

RAM 5H

*Omni***RAM**

*Lab***RAM II** *Lab***RAM I**

*Lab***RAM II H**

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