Surprising Adhesive Properties of Sugru® Mouldable Glue

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MOULDABLE GLUE

Twitter: @sugru
FormFormForm Ltd. (FFF)

- FormFormForm Ltd is the registered UK based company founded in October 2004 by Jane ni Dhulchaoaintigh
- I joined the company in January 2007 to boost development
- Developed Formerol® Technology, patent filed in November 2007
- First product to market was ‘Sugru® Mouldable Glue’ in 2010
- Presently employ 63 people
- FFF has had average YoY growth of 30% generating turnover of £4.4m in 2016
- Based primarily in Hackney, East London
Established Silicone Technologies

**HTV**
- High Temperature Vulcanising
- Organic Peroxides or Pt Catalyzed
- No By-product during cure
- For compression moulded parts, Automotive, Electronics, Construction, Food, Health care and Medical

**LSR**
- Liquid Silicone Rubber
- Low viscosity and also requires high temperature
- Addition cure with Pt catalyst added as 2nd part
- For moulding tubes, O-rings as well as for encapsulants and coatings in Automotive, Medical equipment, Toys, Packages, Houseware, Consumer goods, Storage containers and Furniture

**RTV**
- Room Temperature (RT) Vulcanised
- One part – RTV-1 and Two parts RTV-2
- RTV-1: Moisture Condensation Curing with Organometallic Catalyst
- RTV-2: Addition curing, Pt or UV based cure
- For Sealants and Adhesives in many industries
# Nearest Competitors

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T. Dowden    FormFormForm Ltd.
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Sugru

A RTV-1 Mouldable Silicone Adhesive

OPEN PACK   STICK IT   SHAPE IT   IT TURNS INTO RUBBER
Development of Sugru®

RSC article: “Freeing a world of fixers: Sugru”, September 2014
Formulation vs. Properties

silane cure system (polymer, cross-linker)

fillers (reinforcing, tack-modifying)

catalyst, adhesion promoter, pigments

working time, curing time, consistency, mechanical properties, stability, adhesion, shelf-life
Properties of RTV-1 silicone putty
Adhesion Testing

Tensile mode
ASTM D2095

Cleavage mode
ASTM D1062

Lap Shear
ASTM D1200

Conditions:
• Sugru was cured for 7 days at 25°C, 50%RH
• Roughened surfaces
• 25 different substrates
Adhesion Properties - Tensile

Data generated by Philippe Marks and Reya Shamsa
Adhesion Properties - Cleavage

Data generated by Philippe Marks and Reya Shamsa
Adhesion Properties - Lap Shear

Data generated by Philippe Marks and Reya Shamsa
Dynamic Adhesion Properties - Fatigue Probability

Load-life graph of Sugru to Aluminium

Outcomes:
- At 80% instant failure load lasts ≈ 1k cycles
- At 70% instant failure load lasts ≈ 10k cycles
- At 60% instant failure load lasts ≈ 100k cycles
- Extrapolation suggests < 50% ifl lasts > 1m cycles

Data generated by Samuel Iliffe using QMUL facilities
Summary

• Sugru is versatile material with a unique combination of properties
• Recognised in the media

The Telegraph  “Is this the best invention since Sellotape?”

CNN  “7 Tech Superheroes to watch in 2015”

TIME  “#25 50 Best Inventions List 2010 (iPad #34)"

The Economist  “People did not know they needed the Post-it note when it was first invented but it is now ubiquitous. The same could one day be true of Sugru.”

• Many of these properties are still being characterised (See our TDS!), but adhesion is now well understood.
• FFF is on a mission ‘to help the world get fixing and customising again’
• We are seeking new industrial applications for our technology
Acknowledgements
Thanks for listening!

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