

## Wimpy Red

Intro- This formula was 'invented' by Tony A out in No. CA around Feb- Mar. 2002 mostly because he already had all the ingredients needed on hand to make it. At the time he started dabbling in EX I had just finished with a big home project and found myself with some spare time to mix propellant also. In the past most of my experience was based on AN based motors and I thought making 'a few' AP motors would be fun, little did we know that Tony's recipe would become one of the most popular EX formulas out there. Tony and I were talking back and forth online one night discussing our burn times and grain geometry, etc. and I came up with the bright idea to get real pressure data off several different sizes of motors run at different Kn's to really get this recipe 'characterized'. Motors burned on the test stand ranged from 54mm J's to 98mm M's. The #'s I came up with are slightly different than Tony's #'s that he came up with by using Propel and burn times captured by video but they are slight as you can see below.

Tony's #'s

ISP: 189

Burn rate coefficient: .025

Burn rate exponent: .35

Density: .06154

Woody's #'s

ISP: 190.9

Burn rate Coefficient: .0235

Burn rate exponent: .3473

Density: .06061

The main thing this showed us was that you can come up with worthwhile #'s without spending a lot of money on fancy test equipment. Some of the difference may be due to the different processing techniques we use, Tony mixes by hand, and I use an industrial bread mixer. None of my propellant is vacuum processed. As of this date (June 2005) this recipe has been flown/fired literally hundreds of times in motors ranging from 18mm 'D's' to 28k ns 5" diameter 'O's'. My experience is mostly in Bates grain style motors, but several people have used Wimpy Red to make C-slot type and D grain motors also. If you are interested in these C slots and D grain style motors I encourage you to use liners and casting tubes with extra insulation as this recipe burns rather hot. The RCS liners designed for the AT long burn 54mm motors would be ideal IMO. Here's the recipe:

R45M 12%

DOA 2%

Castor Oil .3%

Tepanol .4%

Silicon Fluid 1 drop per 500 grams

143L 1.9% OR Papi94 1.75%

Red Iron Oxide .1%  
400 mesh spherical Alum. 2%  
Strontium Nitrate 15%  
400 mic AP 11%  
200 mic AP 55%

I'm writing this assuming the reader knows the basics of mixing EX motors and has the basics of safely processing chemicals, cutting grains, coring, disposing of waste materials, etc. If not I urge you to take a course or find a mentor to help you out and teach you. Of course mix all your liquids 1<sup>st</sup>, then metals, and finally end with the AP. When you are done the mix has the consistency of cookie dough so it will have to be hand packed, not poured. As the mix is fairly 'dry' we always pre-wet our casting tubes with a mixture of R45 and curative to get good adhesion of the propellant to the casting tube walls and fill up the spirals on the inside. If you don't do this you may have really bad results as the KN raises drastically when the flame front starts burning down where the propellant isn't bonded to the casting tube and down the inner spirals. This recipe cures rather fast (less than an hour working time) using both Papi94 and 143L and in my opinion a person would do well to replace it with something that cures at a slower rate if he mixes big batches.

As far as grain geometry and nozzle size go, I prefer to run the motors at a very conservative pressure using neutral burning Bates grains. Wimpy Red can be run as low as 150 Kn, I generally run it at a peak of 190 and have yet to blow up a case, your mileage may vary. Others have run it as high as 230 with mixed results, I've seen some 38mm motors cato at 230 and some not. At a peak of 190 it burns smoothly, has great color, and my cases come back alive, what else would a guy want? If you want peak performance it's probably best to not use a recipe like this that's based mostly on 'effect' IMO. At this time I consider Wimpy Red to be 'done', as far as I am concerned. I no longer do any testing on it, just mix and fly it a bunch.

Special thanks to Mark Saunders for naming this propellant in an ill-conceived RMR post in Mar. 2002, without him bitterly complaining about 'the wimpy red' motor test fired on commercial day at Springfest 2002 who knows what it would be called.