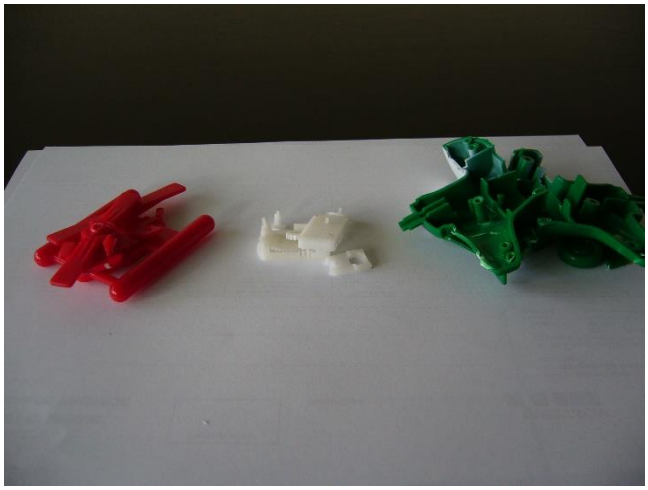
Chemical analysis of lead in toys

Lead is a toxic heavy metal. Approx. 90% of the incorporated lead is deposited in the bones and the teeth

Because lead is released very slowly, it will be accumulated over time in the body. This is dangerous especially for children. The European Norm EN 71-3 regulates the limit of lead in toys. Furthermore, the US norm ASTM F 963-07 regulates the concentration of lead in paints and coatings for toys (max. 600mg/kg). An adequate sample preparation is necessary to determine if toys fulfil these norms.

The first step is to separate the different parts of the toy.



Pre-comminution with the FRITSCH Cutting Mill
For the pre-grinding we used the **Universal Cutting Mill PULVERISETTE 19** or the **Universal Cutting Mill PULVERISETTE 19 *large* with variable speed of 70-700-rpm**. The main advantage of these mills is that you can remove all grinding parts from the grinding chamber without an additional tool. This makes them very easy to clean and cross-contaminations of samples are avoided.

Fig. 3: Pre-grinding with PULVERISETTE 19, 2 mm sieve,

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Milling with the Variable-Speed-Rotor Mill

After the comminution down to 2-4 mm and after a suitable sample division, in the next step with the aid of the **Variable Speed Rotor Mill PULVERISETTE 14 *classic line*** a final fineness of 200-500 µm is achieved.

It should be noted, that cutting tools for the PULVERISETTE 19 should be heavy metal free or knives made of hardmetal tungsten carbide should be used. In order to minimize the thermal impact during the grinding with the speed rotor mill, the sample can be embrittled with liquid nitrogen or dry ice. The element analysis is performed via x-ray fluorescence analysis.

The sample preparation shown here was done with a plastic toy. A comparable sample preparation is also possible with any varnished wooden toy.

Fig. 4: Analytical fineness after milling with PULVERISETTE 14

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