^{10}Be, ^{26}Al, ^{36}Cl, and ^{41}Ca AMS Standards

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Precise standards are essential for all AMS measurements. I have prepared AMS standards and distributed to many AMS laboratories. These standards have been used as primary normalization standards at the University of Rochester, the University of Pennsylvania (Penn), the University of Tokyo, and the Lawrence Livermore National Laboratory (LLNL). Following is a brief summary of the present status of ^{10}Be, ^{26}Al, ^{36}Cl, and ^{41}Ca AMS standards.

^{10}Be (1.5 Myr-half-life is used for Be standards prepared by author): ^{10}Be AMS standards were diluted from a solution prepared by the ICN Chemical & Radioisotope Division in 1983 and 2001. The activity of ICN standard is in excellent agreement with a β counting standard used at UCSD. The activity was also calibrated at the Rutgers University (Herzog, pers. comm.). The uncertainty in original activity is ±5%. NIST has also prepared a ^{10}Be standard, SRM 4325, that yields a ratio 1.15 times higher than the standards prepared by this author. The cause of this discordance is unknown at the present time however we are investigating the problem.

^{26}Al (0.705 Myr): ^{26}Al AMS standards were prepared from the NBS SRM 4229 stock material. The uncertainty in the ^{26}Al activity is 1.1% (±3σ). Three sets of dilutions have been prepared (1983, 1986, and 2001). Each dilution was measured at Penn and at LLNL and found to be in excellent agreement. The Max-Planck-Inst. Kernphysik obtained an aliquot of the 1st dilution (119.4 dpm ^{26}Al) and measured 118.7±3.1 dpm (Heusser pers. comm. 1986). However, the ETH in Zürich measured my AMS standard 30% higher than the ETH ^{26}Al standard that was prepared by University of Köln (Wölfli, pers. comm. 1986, 1987).

^{36}Cl (0.301 Myr): AMS standards were prepared from NBS SRM 4943. The overall uncertainty in the ^{36}Cl activity is ±0.82% (±3σ). These standards have been measured at numerous AMS laboratories and at this time no problems have been noted.

^{41}Ca (0.104 Myr): AMS standards were prepared from highly enriched $^{41}CaCO_3$ from Oak Ridge National Laboratory. The ^{41}Ca isotopic abundance in the original material was measured by thermal ionization mass spectrometry. The overall uncertainty of the ^{41}Ca abundance in original solution is ±0.3% (±2σ).

AMS measurements are based upon normalization to a primary standard. A recommended protocol is that: (1) all AMS labs should note the source of the standards used to obtain their ratios; (2) the half-life used in any calculations should be clearly present in the publication; and (3) all sample calculations should use the same half-life as that of the primary normalization standard.

I wish thank AMS colleagues for measurements of my AMS standards.