***S*-PROCESS XENON IN PRESOLAR SILICON CARBIDE GRAINS AND AGB MODELS WITH NEW CROSS SECTIONS.** M. Pignatari[1], R. Gallino[1], R. Reifarth[2], F. Käppeler[3], S. Amari[4], A. M. Davis[5,6], and R. S. Lewis[5], [1]Dipartimento di Fisica Generale, Universita' di Torino, 10125 Torino, Italy, [2]Los Alamos National Laboratory, Los Alamos, New Mexico, 87545, USA, [3]Forschungszentrum Karlsruhe, Institut für Kernphysik, Postfach 3649, D-76021 Karlsruhe, Germany, [4]Laboratory for Space Sciences and the Physics Department, Washington University, St. Louis, MO 63130, USA, [5]Enrico Fermi Institute, [6]Department of Geophysical Sciences, University of Chicago, Chicago, IL 60637, USA.

Precise neutron capture cross sections of ^{128,129,130}Xe have been measured by Reifarth et al. [1], with 1σ uncertainties of 2%. This allows a reanalysis of the *s*-process Xe predicted in asymptotic giant branch (AGB) stars and its comparison with meteoritic Xe-S carried by presolar SiC grains [2]. Stellar evolutionary models have been calculated and an updated network of neutron captures has been followed [3,4]. Neutrons are provided by the ^{22}Ne(α,n)^{25}Mg reaction activated during recurrent convective He-burning thermal pulses, and by the ^{13}C(α,n)^{16}O reaction, which operates radiatively in the interpulse phases (^{13}C-pocket). ^{12}C and *s*-processed matter from the He shell are mixed with the envelope by third dredge up episodes. The ^{13}C-pocket efficiency may be different in different stars according, e.g., with rotational effects [5]. A large spread of ^{13}C-pocket efficiencies are needed to reproduce spectroscopic observations of different classes of *s*-enhanced stars [6].

Figure 1 shows how the ^{130}Xe normalized Xe-S component fits the AGB models. For the *s-only* isotopes ^{128,130}Xe, the 10% deficit of ^{128}Xe indicates an additional *p*-process contribution to solar. We recall that *p*-only isotopes ^{124,126}Xe are destroyed by neutron captures. The small *s*-process contribution to odd isotopes ^{129,131}Xe are reproduced, as well as the 32% *s*-process contribution to solar ^{132}Xe. As to "*r"-only* pair ^{134,136}Xe, actually a minute *s*-contribution to ^{134}Xe derives from the small neutron channel on unstable ^{133}Xe open at the peak neutron density driven by the ^{22}Ne neutron source.

Since Xe-S is extracted from millions of SiC grains, AGB predictions have been calculated as a grand average: over the low mass AGB range 1.5 to 3 M_{sun}; over a large spread of ^{13}C-pocket efficiencies; over the expected range from solar to half solar metallicity [7]; finally for each AGB model over the envelope mass lost by stellar winds with C/O > 1 (necessary condition for SiC to form).

^{134}Xe is the best indicator of mass and metallicity. For higher AGB initial masses, or lower metallicities, the temperature in the He shell is higher than in low mass AGB stars of about solar metallicity and the ^{22}Ne source is more efficient. The ensuing higher peak neutron density makes a much larger production of ^{134}Xe, at odds with G-SiC, all other isotopes being unchanged. The same occurs in the alternative scenario where Xe is assumed to be implanted directly from the He-shell on pre-existing SiC grains, in the planetary nebula phase. This is illustrated in Figure 2.

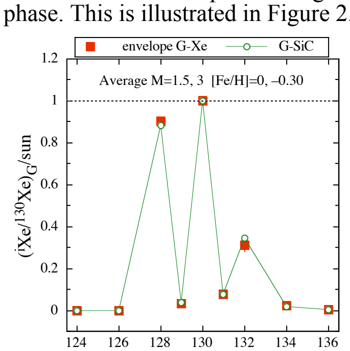

Figure 1

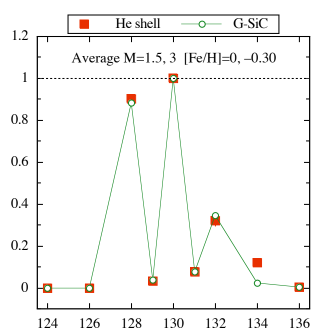

Figure 2

References: [1] Reifarth R. et al. (2002) *Phys. Rev. C 66,* 064603-1-14. [2] Lewis R.S. et al. (1994) *Geochim. Cosmochim. Acta 58*, 471-494. [3] Straniero O. et al. (1997) *Astrophys. J. 478*, 332-339. [4] Gallino R. et al. (1998) *Astrophys. J. 497*, 388-403. [5] Lugaro M. et al. (2003) *Astrophys. J. 586*, 1305-1319. [6] Busso M. et al. (2001) *Astrophys. J. 557*, 802-821. [7] Lugaro M. et al. (1999) *Astrophys. J. 527*, 369-394.