

New insights on ESR dating of siliceous sinter and travertine outcrops on Tibet Plateau and its information for geothermal history

Sheng Wang, Tongyan Lü\*, Zhonghai Wu

Siliceous sinter and travertine are the product of hydrothermal activity under the influence of regional tectonic movement. How to date these outcrops accurately is still an important and hot issue. ESR dating is an important method for obtaining these outcrops ages. In this study, we focus on the ESR spectrums, the thermal stability of ESR centers, and the influence of irradiation in order to improve the reliability of ESR dating.

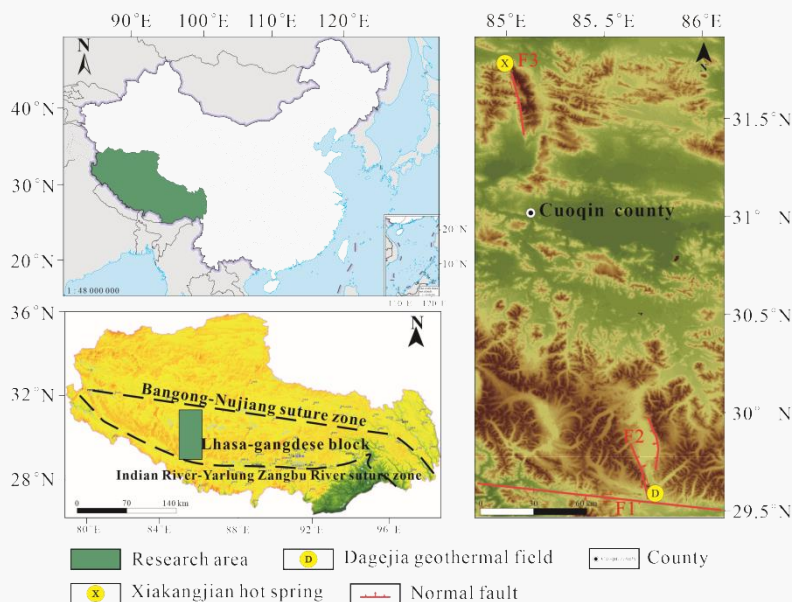


Fig. 1, Location and sketch geological map of research area

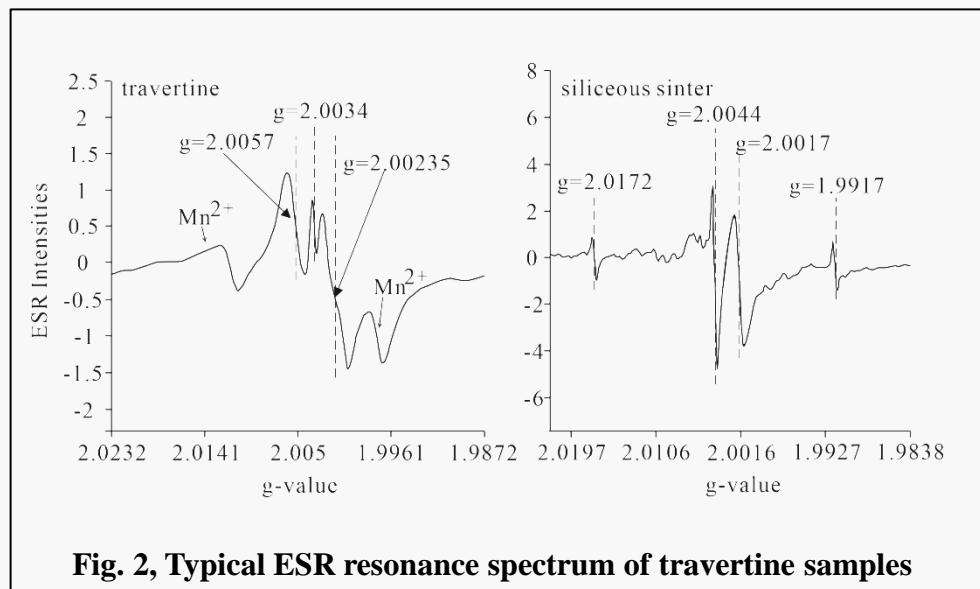


Fig. 2, Typical ESR resonance spectrum of travertine samples

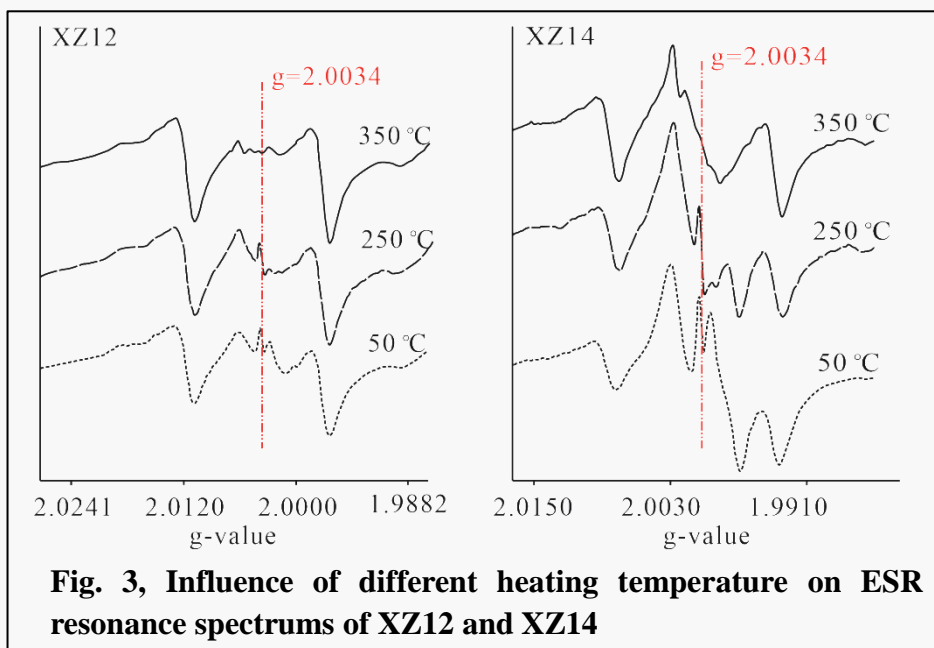


Fig. 3, Influence of different heating temperature on ESR resonance spectrums of XZ12 and XZ14

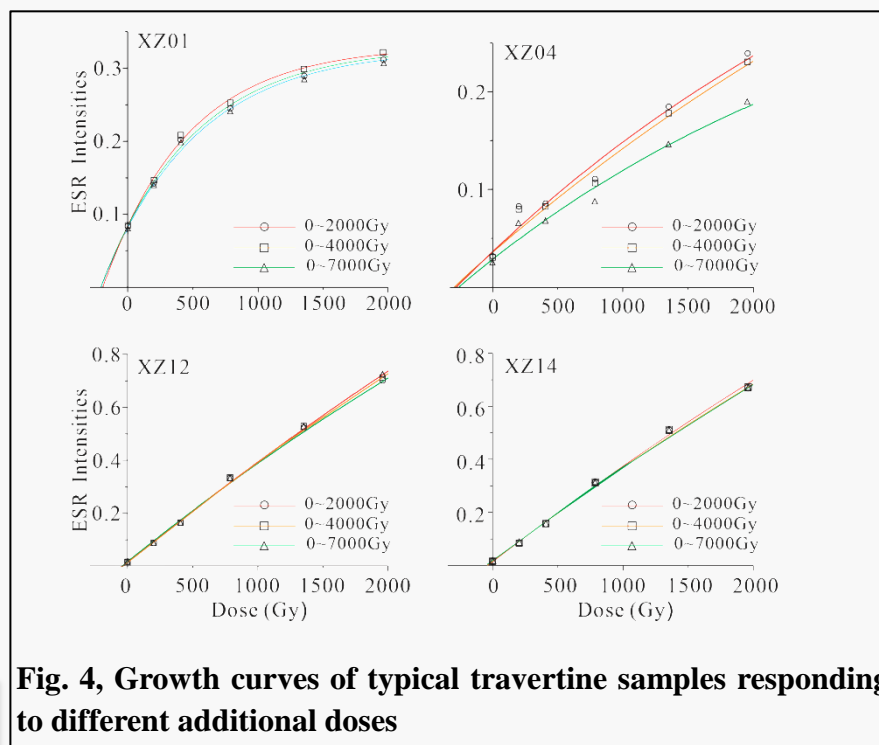


Fig. 4, Growth curves of typical travertine samples responding to different additional doses

Table 1, ESR dating results of siliceous sinter and travertine outcrops on the Tibet Plateau

Sample	Lithology	Th (ppm)	U (ppm)	K (ppm)	De (Gy)	Dose rate (Gy/ka)	ESR age (ka)
XZ01	sinter	3.85	0.655	0.549	203±21	1.145±0.05	177±20
XZ02	sinter	0.222	0.28	0.096	172±49	0.39±0.03	441±130
XZ03	sinter	0.442	0.089	0.267	42±8	0.52±0.03	81±16
XZ04	sinter	2.34	0.355	0.424	258±60	0.86±0.04	300±71
XZ12	travertine	0.279	0.364	0.039	38±11	0.36±0.03	106±32
XZ13	travertine	0.14	0.61	0.018	103±6	0.39±0.03	264±26
XZ14	travertine	0.909	0.909	0.311	41±13	0.78±0.04	53±17

Conclusions

1. The ESR spectrum of the travertine contains the signal at  $g=2.0034$  which is regarded as a relative stable and effective ESR dating signal. It can be used for a dating attempt.
2. Higher irradiation has limited influence on ESR dating for our samples.
3. The dating results show that the Xikangjian travertine were formed in 36-290 ka.